COLLINS's ARITHMETICK,

IN

WHOLE NUMB

AND

FRACTI

BOTH

Vulgar and Deci

With Tables for the Forbe
Rebate of Money, the Summi
of Annuities, and the Purch of
Leaſes at Compound Intereſt.

BY

JOHN COLLINS, Philomath.

Made Publick

By *THO. PLANT* Accomptant.

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THE EPISTLE TO THE READER.

Courteous Reader,

THE Author, Mr. *John Collins*, having in his Life-time been importun'd by several of his Friends to publish something of *Arithmetick*, as a *Necessary Introduction* to the rest of his *Mathematical Treatises*; in order to

their Satisfaction Compos'd this following *Tractate*, which he intended for the Press some time before his Death: But his Design being frustrated by the Intervention of other Extraordinary Occasions, upon his Death-bed he recommended the Publication of it to my Care, together with his earnest Desire, That I would not only Correct it from the Mistakes which too often occur in the First Impression of Books of this Nature; but supply it with such Insertions as I judg'd the Bulk of the Book was conveniently capable of.

As

As to the First of these, I have exerted my best Endeavors, as well for the Preservation of our Author's *W[illegible]* as for the Propagation and Increase of *Mathematical Learning*. But the Latter I purpos[illegible]ly neglected, upon these two Accounts.

First, Because, after a serious Perusal of the following *Treatise*, I could see no just Occasion either for Altering or Augmenting any Part of it, in order to the making it more Perfect or Necessary.

Secondly, Because any considerable Additions would have enhanced the Bulk (and consequently the Price), and so have

have rendred it leſs ſuitable to the Indigence of ſome, and the Parſimony of others; the firſt of which are not able, and the laſt not willing to go to the Price of a larger Volume.

The whole Book is Methodically digeſted into Two Parts: The Firſt Part treateth of *Arithmetick* in *Whole Numbers* only; by which the Studious Learner may be inſtructed in all the *Rules* of *Common Arithmetick*, without being gravell'd with the Difficulties and ſeeming Impoſſibilities which naturally ariſe by the Intertexture of *Whole Numbers*

bers with *Fractions* or *Broken Numbers*. The Second Part explaineth the Doctrine of *Fractions*, both *Vulgar* and *Decimal*, with their Application in the *Rules of Practice*, and the Calculation of *Tables* at *Compound Intereſt*, for the Forbearance and Rebate of Money, the Summing up of *Annuities*, and the Purchaſe of *Leaſes*: All which are handled in a Method ſo plain and familiar, that they are not only ſufficiently intelligible to the meaneſt Capacity, but highly uſeful to thoſe who have made a conſiderable Proficiency in the *Science* of *Numbers*.

If

To the Reader.

If thou approve of this, I will ſhortly preſent thee with Mr *Collins*'s *Gradus ad Mathematicam*, containing *Geometry*, *Trigonometry*, *Surveying*, and *Gauging*. Till then, Farewell.

Thine, *THO. PLANT.*

THE

THE CONTENTS.

PART I.

Chap. I. *Notation of Numbers, and Numeration.* Page 1
Chap. II. *Of Addition in Whole Numbers.* 5
Chap. III. *Of Substraction in Whole Numbers, with Questions for the Exercise of Addition and Substraction.* 9
Chap. IV. *Of Multiplication in Whole Numbers.* 14
Chap. V. *Of Division in Whole Numbers.* 18
Chap. VI. *Of Reduction.* 24
Chap. VII. *Of the Rule of Three Direct and Inverse, with Questions for the Exercise thereof.* 27
Chap. VIII. *Of the Double Rule of Proportion, or Rule compos'd of Five Numbers.* 33
Chap. IX. *Of the Rule of Fellowship.* 38
Chap. X. *Of the Rule of Allegation.* 42
Chap. XI. *Of the Rule of False Position.* 50

PART

PART II.

Chap. I. *Of Vulgar Fractions.* Page 55
Chap. II. *Of the Reduction of Vulgar Fractions.* 57
Chap. III. *Addition of Vulgar Fractions.* 63
Chap. IV. *Substraction of Vulgar Fractions.* 64
Chap. V. *Multiplication of Vulgar Fractions.* ibid.
Chap. VI. *Division of Vulgar Fractions.* 65
Chap. VII. *Of Decimal Fractions.* 66
Chap. VIII. *Reduction of Vulgar Fractions to Decimals, with Decimal Tables.* 68
Chap. IX. *Of the Addition and Substraction of Decimals.* 74
Chap. X. *Of the Multiplication and Division of Decimals.* 75
Chap. XI. *The Rule of Three in Fractions.* 76
Chap. XII. *Of Simple Interest.* 79
Chap. XIII. *Of Compound Interest with Tables for the Forbearance and Rebate of Money, the Summing up of Annuities, and the Purchase of Leases, at* 5, 6, 7, 8, 9, *and* 10 per Cent. *and Questions for the Exercise of Compound Interest.* 85
Chap. XIV. *Practical Questions of Barter, Loss, Gain, Exchange of Coins, &c.* 112
Chap. XV. *Rules of Practice.* 117
Chap. XVI. *Questions for the Exercise of Arithmetick.* 126

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COLLINS's ARITHMETIC

PART I.

Treating of Whole Number

CHAP. I.

1. *Arithmetick* is the Art of Reckoning or Accompting by Number.

2. As in *Geometry* the beginning of all Quantity is a Point, so in *Arithmetick* the Original of all Number is an Unite.

3. Therefore every Number is a Composition of less or more Unites, according to the Nature of the Sum expres'd.

4. *Arithmetick* hath two Parts, *viz. Notation* and *Numeration.*

5. *Notation* is the Art of Writing any Number proposed, or the Expressing of any Sum written.

6. The way to expreſs in Writing any Sum propoſed, is by certain Figures or Characters.

7. Theſe Characters are in Number Ten, *viz.* 1 one, 2 two, 3 three, 4 four, 5 five, 6 ſix, 7 ſeven, 8 eight, 9 nine, 0 nothing; of which the firſt Nine are ſignificant, and the laſt, *viz.* the 0 Cypher, is inſignificant.

8. Every of theſe Figures hath two Values; the one Certain, by its Form; the other Uncertain, by its Place.

9. The Place of every Figure is taken either from its Degree or Period.

10. The Degree of every Figure is that Space or Diſtance it is removed from Unity to the left Hand.

11. Any of theſe Figures ſtanding alone ſignifies it ſelf only; but being tranſpos'd to the left Hand of one or more Figures, encreaſes the Value of the Sum ten times: As in 44 Forty four, the Figure to the right Hand exhibits its own Value, *viz.* 4 Four; but being joined to the left Hand of another 4 Four, enhances the Value from 4 Four, to 44 Forty four.

12. A Period contains three Degrees, and is contrived to expedite the Operation in Numbring from the Right to the Left, as in 49.775, the three laſt Figures 775 are an entire Period, and the two Figures 49 are

are the first Degrees of an Imperfect Period. So in 876.543 there are two perfect Periods.

13. *Numeration* is the Art of Numbring, or finding the Value of a Sum proposed.

14. The Denomination of the first Figure to the Right, being, as is premised, an Unite, the next must be Tens, the next Hundreds; and so every Figure increasing by ten times successively *in infinitum*: As in 465. 919. 296, the first Figure to the Right Hand is six Unites, or Six; the next Figure (being in the place of Tens, and containing nine Unites) is Nine Tens; and the next Hundreds, *&c.* So that the first Period is Hundreds, the next Thousands, and the third Millions: The Value of which Sum is, Four hundred sixty five Millions, nine hundred nineteen thousands, two hundred ninety and six: As you may see by the following Table, which the Learner ought perfectly to understand.

A Table of Numeration.

| *The Ternaries.* | | |

CHAP. II.

Of Addition of Whole Numbers.

1. *Addition* is the Contracting of divers Sums into one Aggre[illegible]

2. *Addition* is either of one or more Denominations.

3. Numbers of one Denomination are ſuch whoſe every Unit is an Integer: As 464 being given to be added to 351, the two Numbers are of one D[illegible]nomination, (*i. e.*) both a Compoſition of Integers.

4. In the placing of Numbers to be added obſerve, That every lower Number ſucceſſively be ſo ſtated, that Tens ſtand over Tens, Hundreds over Hundreds, *&c.* in a direct Line from the higheſt to the loweſt Number: As if 2891 were given to be added to 1295, they muſt ſtand as you ſee.

2891
1295

5. Having drawn a Line under the two Numbers, begin at the Right Hand or place of Units, ſaying, 5 and one make 6, which ſubſcribe exactly under the Figure 5, or place of Units; then proceed to the ſecond place, ſaying, 9 and 9 is 18, which becauſe it exceeds 10 (equal to an Unit in

2891
1295
4186

the next place) by 8, place 8 under the place of Tens, and carry 1 to the next place, saying, 1 that I carry and 2 is 3, which added to 8, makes 11; therefore set down 1 under the place of Hundreds, and carry 1 to the next place; again, 1 that I carr and 1 is 2, which added to _ is 4: T refore the Total of the Sums added is 4186, as you may see in the Margin.

6. But where the Sum of the respective Columns or Ranks exceed 20, the better to ease the Memory in the Computation, make a Point or Prick over the Tens, and having placed the odd Number in its proper place, count the number of Pricks, which carry to the next place to the Left Hand. *Example.*

```
 789456
 956723
 467312
 345724
-------
2559215
```

Let the Sums in the Margin be given to be added together: Beginning as before, say, 4 and 2 is 6 and 3 is 9 and 6 is 15, make a Prick over 6, and having set the 5 in the place of Units, carry the Prick to the next, saying, 1 and 2 is 3 and 1 is 4 and 2 is 6 and 5 makes 11; having set down 1, carry 1 to the next place; and 1 and 7 is 8 and 3 is 11, make a Prick over the Figure 3; proceed, saying, 1 that I carry and 7 is 8 and 4 is 12; a Prick being put over the 4, carry the 2 to the next place,

place, having first set down the odd Number 2, *&c.* And so proceeding with the rest, you shall find the Total to be 2559215. See in the Margin.

7. Addition of divers Denominations is when the Sums proposed consist of divers Values; as if 141 *l.* 12 *s.* 06 *d.* were Sums, 141 Pound 12 Shillings and 6 Pence be given to be added to 2416 *l.* Pound 16 *s.* Shillings and 7 *d.* Pence 2 *f.* Farthings; the Sums are of divers Values, *viz.* Pounds, Shillings, Pence, and Farthings; where every Unit of the successive lower Denomination is a part of an Integer of the higher Denomination, as you may see by the following Table.

4 Farthings		1 Peny.
12 Pence	make	1 Shilling.
20 Shillings		1 Pound.

8. The former Question being so written as you see in the Margin, begin to add the Farthings, saying, 2 and 0 makes 2 Farthings, which place under the place of Farthings, and proceed to the Pence, saying, 7 and 6 is 13 Pence, which because it is above a Shilling (the

l.	*s.*	*d.*	*f.*
141	12	06	00
2416	16	07	02
2558	09	01	02

next Denomination) ſubſcribe 1 *d.* the Exceſs above a Shilling, under the place of Pence, and carry 1 to the next Denomination, ſaying, 1 that I carried and 16 is 17, which added to 12 makes 29 Shillings, ſet down 9 Shillings, and carry 1 Pound to the next Denomination, ſaying, 1 I carry and 6 is 7 and 1 is 8, which ſet under its Complicators 1 and 6: Now becauſe the higheſt Denomination is of Integers, and hath been taught in the 5th. and 6th. of this Chapter, proceed to the Addition of the Remainder by the Directions there given, and the compleat Sum is 2558 *l.* 09 *s.* 01 *d.* 02 *f.*

More Examples of this kind may be theſe.

3	Barly-corns		1 Inch.
12	Inches		1 Foot.
3	Feet	make	1 Yard.
220	Yards		1 Furlong.
8	Furlongs		1 Mile.

Miles.	*Fur.*	*Yards.*	*Feet.*	*Inch.*	*Bar. corn.*
240	7	51	2	9	2
161	5	00	1	11	1
67	6	00	2	00	0
5687	0	140	0	10	0
14	1	11	1	00	2
Tot. 6171	3	204	2	07	2

60 Mi-

60 Minutes	}		1 Hour.
24 Hours	}	make	1 Day Natural.
28 Days	}		1 Month.
13 Months	}		1 Year.

Years.	*Mon.*	*Da.*	*Hou.*	*Min.*
1305	10	25	16	50
42	11	00	15	14
295	05	16	09	38
7459	12	27	21	21
7134	04	20	19	42
Total 16238	06	07	10	45

9. The way to prove *Addition* is by casting it up the contrary way, that is, by Numbring from the top to the bottom; and if it be the same with the first Sum, the Work is right, otherwise false.

CHAP. III.

SUBSTRACTION.

1. *Substraction* is the Diminishing of one Sum by another, or the finding the Difference between any two Sums proposed.

2. Of two Sums given, the Number to be substracted from must always be greater,

or at leaſt as great, as the Number to be ſubſtracted.

3. When a Number is given to be ſubſtracted from another Number, you muſt place them according to the Directions given in the 4th. of the laſt Chapter; that is, Units under Units, Tens under Tens, *&c.* *Example.* Let 421 be given to be ſubſtracted from 642, the Numbers being placed as in the Margin, begin to ſubſtract, ſaying, 1 from 2, there remains 1; which being placed under the Figure 1, again proceed to the ſecond place, take 2 from 4, the difference being 2, place under 2: Laſtly, proceed to the place of Hundreds, ſaying, 4 from 6 and there remains 2, which being placed in its proper place, the whole Remainder is 221, as you ſee by the Work in the Margin.

642
421
221

4. But when the Figure to be ſubſtracted exceeds the Figure to be ſubſtracted from, ſo that you cannot take the lower from the higher, borrow 10, and add it to the ſaid uppermoſt Figure, and having taken the Difference of them, ſubſcribe it as afore directed. Then add the ſaid 10 to the next lowermoſt Figure towards the left Hand. *Example.* Let 38676 be given to be ſubſtracted from 48769: Firſt I take 6 from 9

and

and there remains 3, which being ſubſcribed, I go to the Figure 7, which I cannot take from 6, but taking it from 16 there reſts 9, which I put under the Line for the ſecond Figure, nextly I ſay, 1 that I borrowed and 6 is 7, which taken from 7, the Remainder is 0, which being ſet down, I ſay, 8 from 8 and there reſts likewiſe 0, I put that down, and proceeding to the next place, I ſay, 3 from 4 the difference is 1, which being ſubſcribed, the whole Remainder is 10093.

48769
38676
10093

5. If a Number of divers Denominations be given to be ſubſtracted from another Number either of one or more Denominations, the Queſtion muſt be prepared for Operation according to the 7th. of the laſt Chapter; that is, the Denominations of like Value exactly under each other.

1 *Examp.* Let 41 *l.* 8 *s.* 6 *d.* be given to be ſubſtracted from 62 *l.* 10 *s.* 8 *d.* the Numbers muſt be placed as in the Margin. Then beginning to ſubſtract, ſay in the firſt place, 6 *d.* from 8 *d.* and the Remainder is 2 *d.* which being ſubſcribed under the Pence, proceed to the ſecond Denomination, ſaying, 8 from 10 and the difference is 2 *s.* which

l.	*s.*	*d.*
62	10	8
41	08	6
21	02	2

ſet

ſet down under the Shillings, and ſay again in the place of Pounds or Integers, 1 from 2, the difference being 1, ſet it under the Units in the place of Pounds; laſtly, the difference between 4 and 6 being 2, put down in its proper place, and the whole will be 21 *l.* 2 *s.* 2 *d.*

2 *Examp.* Let 159 *l.* 14 *s.* 7 *d.* 2 *f.* be given to be taken out of 57896 *l.* Obſerving to place Denominations of like Value under each other, according to the laſt Example, filling up the vacant Denominations with Cyphers, the Work will ſtand as in the Margin. And beginning to ſubduct, ſay firſt, 2 Farthings from 0 that I cannot, therefore I borrow 1 from the next Denomination, *viz.* Pence, and taking 2 from it, there remains 2, which I place under the leaſt Denomination, and going to the next, I ſay, 1 that I borrowed and 7 is 8, which cannot be taken out of 0, therefore I borrow 1 *s.* from the next Denomination; 8 *d.* being ſubſtracted from 12 *d.* the Remainder is 4, which I put under its proper Denomination, and carry 1 that I borrowed to the next, ſaying, 1 *s.* and 14 *s.* make 15 *s.* which cannot be taken out of 0, but being taken

l.	*s.*	*d.*	*f.*
57896	00	00	00
00159	14	07	02
57736	05	04	02

taken from 20 *s.* (the Value of an Uni borrowed from the next Denomination, the Remainder is 5 *s.* which I ſubſcribe under the third Denomination, and proceeding to the laſt Denomination, *viz.* Integers, I ſay, 1 that I borrowed and 9 is 10, which I cannot have from 6, but taken from 16 there reſts 6, which I ſubſcribe, and proceeding with the reſt according to the 4th. of this Chapter, the Remainder will be found 57736 *l.* 5 *s.* 4 *d.* 2 *f.* View the Work.

6. The Proof of *Subſtraction* is by adding the Difference of the Sums to the leſs, and if that Sum be equal to the greater the Work is right, otherwiſe erroneous.

Queſtions for the Exerciſe of Addition *and* Subſtraction.

1. WHat Sum is that which if ſubſtracted from 751, the Remainder is 527? *Anſw.* 224 by *Subſtraction.*

2. What Number is that from which if 241 be ſubſtracted, the Remainder is 347? *Anſw.* 588 by *Addition.*

3. What Number is that which being added to 125 makes the Sum to be 675? *Anſw.* 550 by *Subſtraction.*

4. A Miſer hath three Bags of Money, containing in all 2984 *l.* 6 *s.* 0 *d.* of which the firſt contains 324 *l.* 10 *s.* 0 *d.* and the ſecond 913 *l.* 0 *s.* 6 *d.* the Queſtion is, What the third contains? *Anſw.* 1746 *l.* 15 *s.* 6 *d.* by *Addition* and *Subſtraction.*

CHAP. IV.

Of MULTIPLICATION.

1. *Multiplication* is the Encreaſing of a Number propoſed any Number of times given: Or a compendious Working of *Addition.*

2. *Multiplication* hath three Parts, *viz.* the *Multiplicand*, the *Multiplicator*, and the *Product*; of which the two firſt are always given, and the laſt required.

3. The *Multiplicand* is the Number multiplied, the *Multiplicator* the Number multiplying, and the *Product* is the Reſult of the Multiplication.

4. *Multiplication* is either *Single* or *Compound.*

5. *Single Multiplication* is when the *Multiplicand* and *Multiplicator* conſiſt of each a ſingle Figure only, and the *Product* of two at moſt; as 2 times 2 is 4, 6 times 6 is 36: And

as in the Margin, begin with the first Figure to the Right Hand, saying,

4689
281
4689
37512
9378
1317609

1 times 9 is 9, which place under the place of Units; now becauſe 1 does not multiply a Number, the first Rank will be 4689; proceeding to the next Figure in the *Multiplicator*, ſay, 8 times 9 is 72, place the Figure 2 under its *Multiplicator* 8, and carry 7 to the next place, ſaying, 8 times 8 is 64, and 7 I carried is 71; therefore ſet down 1, and carry 7 again to the next place, ſaying, 8 times 6 is 48 and 7 is 55, ſet down 5, and going to the next place ſay, 8 times 4 is 32 and 5 I carried is 37, which being ſubſcribed, proceed to the next Figure in the *Multiplicator*, ſaying, 2 times 9 is 18, place the 8 under the Figure 2 by which it is produced, and carry 1 to the next place, ſaying, 2 times 8 is 16 and 1 is 17, ſet down 7, and ſay again, 2 times 6 is 12 and one is 13, ſet down 3, and proceed to the laſt place, ſaying, 2 times 4 is 8 and 1 that I carried is 9; ſo the three ſeveral *Products* will ſtand as you ſee: Laſtly, adding them together, the whole *Product* is 1317609, as by the Work appears.

8. When a Number propoſed hath one or more Cyphers annexed to the Right Hand,

Hand, the Operation may be abbreviated thus. Cut off the Cyphers by a Line, and multiply the ſignificant Figures as before, adding the Cyphers to the Right Hand of the *Product*.

Example. Let the Sums in the Margin be given to be multiplied. Cutting off the Cyphers in both Numbers, the *Product* of the Significant Figures is 8975, to which adding the two Cyphers, the whole *Product* is as in the Margin. Thus the *Product* of any Number by 10 may be found by adding a Cypher to the *Multiplicand*, by 100 by adding two Cyphers, *&c.*

359|0
25|0
1795
718
897500

9. The Proof of *Multiplication* is by *Diviſion*, which we will treat of in the next Chapter.

CHAP. V.

Of DIVISION.

1. *Diviſion* teacheth us to find how oft one Sum is contained in another.

2. *Diviſion* hath three Parts, *viz.*, the *Dividend*, the *Diviſor*, and the *Quotient*. The *Dividend* is the Number to be divided, the *Diviſor*

Diviſor the Number to be divided by, and the *Quotient* the Number ſhewing how oft the *Diviſor* is contain'd in the *Dividend.*

3. *Diviſion* is either *Single* or *Compound.*

4. *Single Diviſion* is when the *Diviſor* conſiſteth of a ſingle Figure only, and the *Dividend* of two at moſt: And this may be perform'd either by Memory, or by the Table of *Multiplication*, thus. Find the *Diviſor* in the top Column, looking down the ſaid Column till you find the *Dividend*, and the Figure in the ſide Column is the *Quotient* ſought.

Example. Let 36 be given to be divided by 6: Here finding 6 in the top Column, and 36 in the Body of the Table in the ſame Row, the Number which ſtands over againſt the *Dividend* in the firſt Column is 6, and ſo many times is 6 contain'd in 36.

5. *Compound Diviſion* is when the *Dividend* conſiſteth of many Places, and the *Diviſor* of one or more Figures.

6. When a Queſtion belonging to *Compound Diviſion* is propoſed, firſt write down the *Dividend*, making a crooked Line of ſeparation on both ſides of it, placing the *Diviſor* on the Left Hand of the *Dividend*: Then diſtinguiſh by a Point or Prick ſo many of the Figures towards the Left Hand of the *Dividend*, as are equal to or next exceeding

ceeding the *Diviſor*, and ask how oft the *Diviſor* is contain'd in the ſaid Sum; the Anſwer place within the crooked Line on the Right Hand of the *Dividend*. Then multiply the *Diviſor* by the Figure in the *Quotient* laſt found, placing the *Product* under the aforeſaid ſeparated Number, and drawing a Line under the two Numbers, ſubſtract the lower from the higher, and ſubſcribe the Difference under the Line.

Again, Make a Point under the next Figure in the *Dividend*, which annex to the Right Hand of the Remainder in the laſt Work, the Sum ſhall be a new *Dividual*, which muſt be proceeded with as before.

Example. Let 282 Pounds be given to be divided between two Perſons. Having ſtated the Numbers as you ſee in the Margin, and made a Point under the Figure 2 in the *Dividend*, ask how oft 2 is to be had in the ſeparated Figure, *viz.* 2; the Anſwer is 1, which place in the *Quotient*, and ſay, 1 times 2 is 2, which place under its Dividual 2. Then drawing a Line under the two Sums, ſubſtract the lower from the higher, and the Difference is 0, which being ſubſcribed under

```
2) 282 (141
   ...
   2
  ---
   08
    8
  ---
    02
     2
  ---
     0
```

under the Line, make a Prick under the Figure 8 in the *Dividend*, and draw it down to the Right Hand of the 0 for a new *Dividual*; then ask how oft 2 is contain'd in 8; the Anſwer (being 4) place in the *Quotient* after the Figure 1, and multiplying 2 by 4, the Product is 8, which being ſubſtracted from 8, the Remainder is 0, which being placed under the Line, draw down the laſt Figure in the *Dividend*, *viz.* 2, which being annexed to the 0, the *Dividual* is 2: Then asking how oft the *Diviſor* is contain'd in 2 the *Dividual*, the *Quotient* is 1, which place in the *Quotient*, and multiplying 2 by 1, the Product is 2, which being ſubſtracted from 2, there remains 0; and the Work will ſtand as in the Margin: Whereby I find, that 2 is contain'd in 282 juſt 141 times; or that if 282 Pound be divided amongſt 2 Perſons, each Mans Share is 141 Pound.

A ſecond Example is, If 127896 be given to be divided by 18: The Numbers being ſtated as in the Margin, I ask how oft 18 in 12 (the two firſt Figures in the *Dividend*); but the *Diviſor* being greater than the firſt *Dividual*, I make a Prick under 7 the next Figure in the *Dividend*, and then I ask how oft 18 in 127, which I find to be 7; this being put in the *Quotient*, I multi-

ply

ply 18 by 7, and the Product is 126, which being placed under the *Dividual*, and a Line drawn under it, I subſtract the lower from the higher, and the Remainder is 1, which I ſubſcribe under the Line: And making a Point under the next Figure in the *Dividend*, I draw it down to the Right Hand of the Remainder, and ſo my next *Dividual* is 18: then I ask how oft 18 is to be had in 18; and the Anſwer, *viz.* 1, I put in the *Quotient* after the Figure 7, and multiplying 18 by 1, the Product is ſtill 18, which ſubſtracted from 18, there remains 0. Again, having made a Prick under the Figure next ſucceeding in the *Dividend*, and annexed it to the 0, my next *Dividual* is 9, which being leſs than the *Diviſor*, I therefore put a Cypher in the *Quotient*, and bring down the laſt Figure in the *Dividend*, which annexed to 9 the laſt *Dividual*, makes the new *Dividual* to be 96: Then I ask, How oft is 18 contain'd in 96? The Anſwer I find to be 5, which being put in the *Quotient*, and multiplied into 18, the Product is 90, which ſubſtracted

```
18) 127896 (7105
    ....
    126
    ----
    0018
      18
    ----
      096
       90
    ----
        6 remains.
```

ſubſtracted from 96, the Remainder is 6; and the *Quotient* is 7105, as you may ſee by the Work. So that I find 18 is contained in 127896, 7105 times and over and above a Remainder of 6, which being reduc'd to a Fraction is juſt one third part: So that the whole *Quotient* is $7105\frac{1}{3}$.

7. When you are to divide a Number by an Unit with Cyphers annexed to it, that is, by 10, 100, 1000, *&c.* cut off as many Figures to the Right Hand of the *Dividend*, as are Cyphers in the *Diviſor*; ſo ſhall the Figures on the Left Hand be the *Quotient*, and thoſe on the Right the Remainder: Or if the *Diviſor* and *Dividend* have each a Cypher or Cyphers annexed, cut off from each an equal number of Cyphers, and divide the reſt, the *Quotient* found is the *Quotient* required.

Example. To divide 3500 by 10|00, firſt I cut off from each two| Cyphers, and then the *Dividend* is 3|5, and the *Diviſor* 1|0. Therefore I cut off from each a Figure to the Right Hand, and the *Quotient* laſt found is 3 and a Remainder of 5, equal to $\frac{5}{10}$ or $\frac{1}{2}$.

8. *Multiplication* and *Diviſion* do mutually prove each other: For if you divide the *Product* of two Sums by the *Multiplicator*, and the *Quotient* be equal to the *Multiplicand*,

tiplicand, the Work is right, otherwiſe falſe. Or if in *Diviſion* you multiply the *Quotient* by the *Diviſor*, and to the *Product* add the Remainder (if any be) if the Work be right, the Sum found ſhall be equal to the *Dividend*.

CHAP. VI.

Of REDUCTION.

1. *Reduction* is the changing of one Denomination into another.

2. *Reduction* is either *Deſcending* or *aſcending*.

3. *Reduction Deſcending* is when a Sum propos'd in a higher Denomination, is requir'd to be chang'd into a lower Denomination.

4. Queſtions belonging to *Reduction Deſcending* are to be perform'd by *Multiplication*, thus: Multiply the propounded Sum by as many Units as are Parts of the lower Denomination contain'd in an Integer of the higher Denomination, the Product is the Value of the Number propos'd, reduc'd into the Parts of the lower Denomination required.

Example. Let 18 Pound be given to be reduc'd into Pence: Firſt multiply 18 by

20, the number of Shillings in a Pound, the Product is 360, and so many Shillings is there in 18 Pound. Again, multiplying 360 by 12, the number of Pence in a Shilling, the Product is 4320, and so many Pence is there in 18 Pound. See the Operation.

18 *Pound.*
20
360 *Shillin.*
12
720
360
4320 *Pence.*

The like may be perform'd by Weights, Measures, *&c.* Thus 20 Pound *Troy* may be reduced into 240 Ounces, 240 Ounces into 1920 Drams, and 1920 Drams into 5760 Scruples; as you may see by the Operation in the Margin.

20 *Pound.*
12
240 *Ounc.*
8
1920 *Dram.*
3
5760 *Scrup.*

5. *Reduction Ascending* is when a Number of a lower Denomination is propos'd, and the Value of it requir'd in a higher Denomination.

6. *Reduction Ascending* is to be wrought by *Division*, thus: Divide the Sum propounded by a Number equal to the Units of the lower Denomination contain'd in an Unit of the higher Denomination, the *Quotient* is the number of Integers required.

Example. Let 9600 Farthings be given to be reduced to Pounds: First divide the number of Farthings propos'd by 4, the Farthings in a Peny, and the *Quotient* is 2400, the number of Pence contain'd in 9600 Farthings. Again, dividing 2400 by 12, the number of Pence in a Shilling, the *Quotient* is 200, and so many Shillings is there in 9600 Farthings. Lastly, dividing 200 by 20, the *Quotient* is 10, and so many Pound is there in 9600 Farthings. View the following Work.

```
              12      20
4) 9600 (2400 (200 (10
   ....    ...    ..
   8       24     20
   --      --     --
   16      000    00
   16
   --
    000
```

CHAP.

CHAP. VII.

Of the Rule of Three.

1. HAving in the preceding Chapters briefly explain'd the *Species* of *Common Arithmetick*, I come now to the *Comparative Part*, which treateth of Numbers *Geometrically Proportional.*

2. The *Rules of Proportion* are either *Single* or *Plural.*

3. The *Rules of Single Proportion* are, when all the Terms which conſtitute the Queſtion maintain a mutual Dependence.

4. *Single Proportion* is either *Simple* or *Compound.*

5. The *Simple Rule of Proportion*, otherwiſe call'd *The Rule of Three*, or *Golden Rule*, teaches us by Three given Numbers to find a Fourth in proportion thereto.

6. The *Rule of Three* is either *Direct* or *Inverſe.*

7. The *Rule of Three Direct* is, when the firſt Term hath ſuch proportion to the ſecond, as the third Term hath to the fourth.

8. The *Inverſe Rule of Three* is when the third Term hath ſuch proportion to the ſecond, as the firſt hath to the fourth.

9. Of the three Terms of the *Rule of Proportion*, whether *Direct* or *Inverse*, the two first always imply a Supposition, and the third a Demand. *Example.* If 6 Men spend 14 *l.* (in a certain time) how much will 9 Men spend in the same time? Here the Supposition is, If 6 Men spend 14 *l.* and the Question is, What will 9 Men spend?

10. A Question belonging to the *Rule of Three* being propounded, two things must be carefully observ'd.

First, That the Terms of the Question be so disposed, that the Term which moveth the Question or Demand possess the third place, and the Number of the same Denomination, or first Number in the Supposition, be set in the first place, and the other Term in the middle between the aforesaid Terms.

Secondly, That if the third Term be greater than the first, and require a fourth Number greater than the second, *& contra*, the Work belongs to the *Rule of Three Direct*, and must be performed thus. Multiply the second Term by the third, and divide the Product by the first, the Quotient is the fourth Term sought. But if the third Term be greater than the first, and require a fourth Term less than the second; or if the

the third Term be leſs than the firſt, and require a fourth Term greater than the ſecond: In both theſe Caſes the Queſtion muſt be wrought by the *Rule of Three Inverſe*, thus. Multiply the ſecond Term by the firſt, and divide the Product by the third Term, the Quotient is the fourth Term required. *Examp.* Let the former Queſtion be again repeated: If 6 Men ſpend 14 *l.* what will 9 Men ſpend? The Terms being ſtated according to the foregoing Directions, ſtand thus.

Men. *li.* *Men.*
6———14———9

Now to find whether the Queſtion be reſolvable by the *Direct* or *Inverſe Rule of Three*, I conſider whether the third Term give more and require more, or give leſs and require leſs, *&c.* And in this Example my Reaſon tells me, That if 6 Men ſpend 14 *l.* in a certain time, 9 Men will ſpend more in the ſame time: Wherefore I conclude the Queſtion belongs to the *Rule of Three Direct.* So that multiplying 14 by 9, the Product is 126; which divided by 6, the Quotient is 21; and ſo many Pound will 9 Men ſpend. See the Work following.

Men. *li.* *Men.* *li.*
6——14——9——21

9
6) 126 (21
12
06
6
0

Another Example is, If 5 Yards of Broadcloth (the Piece being one Yard and a half in breadth) make a Sute of Clothes, how many Yards of Silk of half a Yard broad will ſerve to line the ſame?

The Queſtion being ſtated as afore-directed, ſtands thus.

Half-yards. *Half-yards.* *Half-yards.*
3——————10——————1

And conſidering whether it muſt be perform'd by the *Direct* or *Inverſe Rule*, I find, that if 3 Half-yards in breadth require 10 Half-yards or 5 Yards in length to make a Sute of Clothes, 1 Half-yard in breadth muſt needs require more. Therefore the Queſtion belonging to the *Rule of Three Inverſe*,

verſe, I multiply the firſt Term by the ſecond, and divide the Product by the third, and the Quotient proceeding is 30 Half-yards, or 15 Yards; and ſo many in length will one Half-yard in Breadth require to line the aforeſaid Sute. See the Operation.

Half-y. *Half-y.* *Half-y.* *Half-y.*
3 —— 10 —— 1 —— 30

3

1) 30 (30 *Half-y. or* 15 *Yards.*

3

∞

11. The Proof of the *Rule of Three* is as followeth. If the Queſtion be wrought by the *Rule of Three Direct*, compare the Product of the two Extremes with the Product of the two Means, and if they be equal the Work is truly perform'd, otherwiſe not. So in the firſt Example, the Product of 6 multiplied by 21 is 126; and the Product of 14 by 9 is alſo 126; which being equal, I conclude the Work is right.

But in the *Inverſe Rule*, compare the Product of the ſecond by the firſt, with the Product of the fourth by the third, and if they agree, the Work is right. So in the laſt Example, the Product of 10 by 3 is 30.

equal to the Product of 1 by 30; therefore the Work is right.

Queſtions for the Exerciſe of the Rule of Three.

1. A Merchant buys 3671 Pound of Tabacco, which coſt him 110 *l.* Alſo for Fraight and Cuſtom he paid 25 *l.* and the Expences of the Voyage were 16 *l.* For how much muſt he ſell 1 Pound of it, to gain 62 *l.* by the whole? *Anſw.* 1 *s.* 1 *d.* 3 *f.* and ſomething above half a Farthing more.

2. If my Friend lend me 100 *l.* for 6 Months, how long ſhall I lend him 50 *l.* to requite his Kindneſs? *Anſw.* 12 Months.

3. If 6 Workmen do a Piece of Work in 14 Days, in how many Days will 4 Workmen do the ſame? *Anſw.* In 21 Days.

CHAP.

CHAP. VIII.

Of the Double Rule of Proportion.

1. THE *Double Golden Rule*, or *Rule compos'd of Five Numbers*, teaches us by Five known Numbers to find a Sixth in proportion thereto.

2. Of theſe five Numbers the firſt three always contain a Suppoſition, and the two laſt a Demand. *Examp.* If 100 *l.* gain 6 *l.* in 12 Months, what will 75 *l.* gain in 9 Months? The three firſt Numbers, *viz.* If 100 *l.* in 12 Months gain 6 *l.* is the Suppoſition; and the Demand is, What will 75 *l.* gain in 9 Months?

3. Care muſt be had in placing theſe Terms; for which obſerve theſe Directions. 1. That the firſt Term be of the ſame Denomination with the fourth, the ſecond with the fifth, and the third with the Term required. 2. That in the Poſition of them the firſt Term or Suppoſition muſt poſſeſs the firſt place, the third Term or laſt Suppoſition muſt be in the ſecond place, and the fourth Term or firſt Number in the Demand muſt be in the third place. Then placing the ſecond Term in the Queſtion

and Suppoſition under the firſt Term, and the fifth Term of the Queſtion and ſecond of the Demand under the fourth of the Queſtion and firſt of the Demand, the Work will ſtand as you ſee.

l.	*l.*	*l.*
100	6	75
12		9

4. Queſtions belonging to this Rule may be reſolved either by two ſingle Rules of Three, or by the Rule compoſed of five Numbers.

5. To do it by two Single Rules, obſerve whether either of the Queſtions be *Inverſe*, or both *Direct*. If both be *Direct*, as in the laſt Example, the Proportion is,

1. *As the firſt Term in the uppermoſt Rank,*
To the middle Term:
So is the laſt Term in the firſt Rank,
To a fourth Number.
2. *As the firſt Term in the lower Rank,*
To the fourth Sum found:
So is the laſt Term in the lower Rank,
To the Term required.

So that multiplying 75 by 6, the Product is 450; which divided by 100 *quotes*, 4 *l.* 10 *s.* Therefore if 100 *l.* gain 6 *l.* in

12 Months, 75 *l.* will gain 4 *l.* 10 *s.* in the ſame time.

Say again, If in 12 Months 4 *l.* 10 *s.* be gained, how much will be gained in 9 Months? Multiply and divide, and the Number proceeding is 3 *l.* 7 *s.* 6 *d.* Therefore if 100 *l.* gain 6 *l.* in 12 Months, 75 *l.* will gain 3 *l.* 7 *s.* 6 *d.* in 9 Months.

6. To do this by one Operation, having repeated the foregoing Queſtion, and placed them as you ſee, Multiply the two Numbers in the firſt Column for the firſt Term in the ſingle Operation, the Number 6 being ſtill the ſecond, the third Term muſt be the Product of the two Numbers in the laſt place. With theſe three Numbers multiplying and dividing, the Anſwer is 3 *l.* 7 *s.* 6 *d.* according to the former Work. See the Operation.

100——6——75
12—— ——9

1200 675
6

1200) 4050 (3
3600

450
20

1200) 9000 (7
8400

600
12

7200 (6
7200

7. As

7. A ſecond Example is, If 100 *l.* gain 6 *l.* in 12 Months, in how many Months will 75 *l.* gain 3 *l.* 7 *s.* 6 *d.* The Queſtion being ſtated according to the former Directions, ſtands thus.

li.	*Mon.*	*li.*
100	12	75
6		3 7 *s.* 6 *d.*

Therefore ſay, If 100 *l.* gain 6 *l.* in 12 Months, in how many Months will 75 *l.* gain the ſame? Here becauſe leſs is given and more required, proceed to the Reſolution by the Inverſe Rule, and you ſhall find the Anſwer to be 16, and ſo many Months will 75 *l.* require to gain 6 *l.*

Again ſay, If 6 *l.* require 16 Months, what time will 3 *l.* 7 *s.* 6 *d.* require? Proceeding to work this Queſtion by the *Direct Rule of Three*, the Anſwer is 9 Months. Therefore if 100 *l.* gain 6 *l.* in 12 Months, 75 *l.* will gain 3 *l.* 7 *s.* 6 *d.* in 9 Months. Now becauſe this laſt Queſtion is the Inverſion of the former, they mutually prove each other.

8. But to do this by the *Rule Compound of the Five Numbers*, having replaced them according to the preceding Order, (the two Rules being of contrary Natures, *i. e.* the one

one *Direct* and the other *Inverse*) multiply them croſs-wiſe, that is, the firſt Term of the firſt Rank by the laſt Term of the ſecond Rank, and the laſt Term of the firſt Rank by the firſt Term of the laſt Rank, placing the *Products* under their reſpective *Multiplicators*: And proceed with theſe two Numbers for the firſt and laſt Terms of a *Rule of Three.* But always note, *That if the* Inverſe Rule *be found in the lower Line, the Single Operation muſt be wrought by an* Inverſe Rule: *But if it be found in the upper Line, it muſt be done by a* Direct Rule.

But in this Queſtion the *Inverſe Rule* being found in the uppermoſt Line, reſolve it by the *Direct Rule of Three*, and the Anſwer will be (as before) 9 Months, as by the Operation appears.

The ſeveral Terms of Money being reduced to Pence will ſtand as followeth.

li.	*d.*	*Mon.*	*d.*	*l.*
100 *is*	24000	— 12 —	18000 *in*	75
6 *is*	1440	——	810 *in*	3 *l.* 7 *s.* 6 *d.*

As 2592000 — 12 — 19440000

12

2592) 233280 (9 *Months.*

23328

00000

CHAP.

CHAP. IX.

Of the Rule of Fellowſhip.

1. THE Rules of *Plural Proportion* are ſuch as cannot be performed by one Operation of the *Rule of Proportoin*; as *Fellowſhip*, *Allegation*, *&c.*

2. The *Rule of Fellowſhip* is that which teacheth us (by knowing the ſeveral Parts of which a Common Stock is compoſed, with a ſuppoſed Loſs, Gain, *&c.* reſulting from the ſaid Stock hy Trading, *&c.*) to determine the ſeveral Shares of the Loſs, Gain, *&c.* in proportion to the Shares of the Principal.

3. The *Rule of Fellowſhip* is either *without* or *with Time*. The *Rule of Fellowſhip without Time* is when the ſeveral Stocks continue in Company for equal Times: In which the Proportion is,

As the Total of the Stock,
To the Aggregate of the clear Loſs or Gain:
So is each particular Stock,
To its reſpective Loſs or Gain.

1 *Example.* Two Butchers, *A.* and *B.* buy a certain number of Oxen, which coſt 157 *l.* of which *A.* paid 100 *l.* and *B.* 57 *l.* by which they gain 30 *l.* 10 *s.* I demand

each

each Man's particular Share of the Gain.

Here 100, the Stock of *A.* and 57, the Stock of *B.* are to be added together, whoſe Total 157 muſt be the firſt Term in the *Rule of Three*; 30 *l.* 10 *s.* the whole Gain, the ſecond; and 100, the Stock of *A.* the laſt Term, *&c.* Therefore ſay,

	li.	*li.*	*s.*		*li.*	*s.*	*d.*
As	157	— 30	10	100 =	19	8	$7\frac{1}{2}$
				57 =	11	1	4
					30	9	$11\frac{1}{2}$

So that *A.* muſt have 19 *l.* 8 *s.* 7 $\frac{1}{2}$ *d.* and *B.* 11 *l.* 1 *s.* 4 *d.* The two Sums added make 30 *l.* 9 *s.* 11 $\frac{1}{2}$ *d.* which defect of a Halfpeny is occaſioned by the Fractional Parts in the Operation.

4. But where the Operations are numerous by the *Rule of Three*, to avoid the tediouſneſs of *Diviſion*, divide the whole Gain or Loſs, which is the ſecond Term, by the Total of the Stocks, or the firſt Term, the *Quotient* is a *Common Multiplicator*; by which multiplying each Mans particular Stock, the Reſult is his reſpective Part of the clear Loſs or Gain.

2 *Example.* Four Merchants, *A. B. C. D.* raiſe a Common Stock of 1405 *l.* of which

A. pur

A. put in 320 *l.* *B.* 120 *l.* *C.* 345 *l.* and *D.* 620 *l.* In a certain time the aforesaid Stock is encreased to 2810 *l.* I demand each Man's Part thereof. According to the aforesaid Direction, dividing 2810 *l.* the Total of the Stocks encreased, by 1405, the Sum of the principal Stocks, the *Quotient* is 2 for a *Common Multiplicator*; by which multiplying the respective principal Stocks, the several *Products* are as following,

As 1405—2810 {
320 = 640 *A.*
120 = 240 *B.*
345 = 690 *C.*
620 = 1240 *D.*
2810

5. The *Double Rule of Fellowship*, or the *Rule of Fellowship with Time*, is when the first and third Terms in the *Rule of Proportion* are *Multiplex* of the Stock put into Company, and the Time it is continued. Therefore the Proportion is,

As the Sum of the Products made by the Multiplication of each Man's Stock by its Time,
To the whole Gain or Loss:
So is each particular Product,
To its respective Gain or Loss.

3 *Example.* Three Merchants enter into Fellowſhip: *A.* put in 100 *l.* the firſt of *April*, *B.* laid in 133 *l.* 6 *s.* 8 *d.* and *C.* laid in 300 *l.* *B.* laid in his Money the firſt of *July*, and *C.* his the firſt of *December*. They continued trading till the firſt of *April* next, in which time they had gained 300 *l.* I demand the ſeveral Parts of *A.* *B.* and *C.*

Firſt, conſider how long every Man's Stock continued in Company, by which multiplying every Man's Stock, the *Products* are as followeth.

Mon.	*li.*	*s.*	*d.*		
12 ×	100	0	0 =	1200	
9 ×	133	6	8 =	1200	
4 ×	300	0	0 =	1200	

As 3600-300 { 1200—100 *A.* / 1200—100 *B.* / 1200—100 *C.* } *li.* 300

So that each Man muſt have 100 *l.* as you may ſee by the Operation.

6. The Proof of the *Rule of Fellowſhip* is by comparing the Sum of the ſeveral Sharers Parts of the clear Loſs or Gain, with the whole Gain or Loſs; and if they agree, the Work is right, otherwiſe erroneous. As in the ſecond Example, the ſeveral Parts of *A.* *B.* *C.* and *D.* being added together, make

make 2810, equal to the whole Gain. Likewiſe in the third Example, the ſeveral Parts of *A. B.* and *C.* being added, are equal to 300 *l.* the whole Gain.

CHAP. X.

Of the Rule of Allegation.

1. THE *Rule of Allegation* treateth of the Mingling or Concorporating of divers Simples into one Maſs.

2. *Allegation* is either *Medial* or *Alternate.*

3. *Allegation Medial* is when the Quantity and Rates of the ſeveral Simples being given, it is required to find a Mean Rate or Price for which the whole Mixture, or any Part thereof, may be afforded.

4. In *Allegation Medial* the Proportion is,

As the Total Quantity of the Simples,
To the Total Value of them all:
So is any Part of the Mixture,
To the Mean Rate required.

Example. A Man mixes 10 Buſhels of Oats at 24 Pence the Buſhel, 7 Buſhels of Barley at 30 Pence the Buſhel, 17 Buſhels of

of Rye at 40 Pence the Buſhel, and 22 Buſhels of Wheat at 48 Pence the Buſhel. The Queſtion is, What one Buſhel of that Mixture is worth? To perform this, I firſt add the ſeveral Quantities together, thus: 10 and 7 is 17 and 17 is 34 and 22 is 56; and ſo much is the Total of the Quantities. Next I find the Value of them, thus: As 1 Buſhel is to 10, ſo is 24 Pence to 240 Pence, the Value of the Oats. Again, As 1 is to 7, ſo is 30 to 210 Pence, the Value of 7 Buſhels of Barley. Again, As 1 is to 17, ſo is 40 to 680 Pence, the Value of 17 Buſhels of Rye. And laſtly, As 1 is to 22, ſo is 48 to 1056 Pence, the Value of the premiſed Wheat. Finally, adding 240, 210, 680 and 1056 together, the Aggregate is 2186 Pence, the Value of all the Simples. Now to find what 1 Buſhel of this Miſtling is worth, I ſay,

As 56 (*the Sum of the Quantities*)
To 2186 (*the Value of the Simples*)
So is 1 (*the Quantity propoſed*)
To 39 *Pence* (*the Mean Rate required*).

So that I find one Buſhel of the aforeſaid Miſtling may be afforded for 39 Pence and about a ſeventh part of a Farthing more. See the Operation.

56——2186——1

1 *d.*

56) 2186 (39 $\frac{2}{5}\frac{2}{6}$ *or* 1 *ſeventh*
(*of a Farthing.*

168

0506

504

002

5. *Allegation Alternate* is when the Price of the ſeveral Simples is given, and ſuch a Quantity of each required as may make a Mixture that will bear a certain Mean Rate propoſed.

6. *Alternate Allegation* is either *Total* or *Partial.*

7. *Allegation Total* is when the Sum of the Quantities being given, it is required to find how much of each Ingredient the Mixture muſt conſiſt of. To effect which, you muſt place the Prices of the ſeveral Simples in ſuch order, that the greateſt ſtand in the higheſt place, and the next inferior Rate exactly under it; and ſo proceed with the reſt ſucceſſively, placing the Mean Rate or Price on the left Hand of the ſaid Prices or Rates.

Example.

Example. A Wine-Cooper hath four ſorts of Wine, *viz.* Canary at 2 *s.* or 24 Pence the Quart, Sherry at 20 Pence the Quart, Rheniſh at 16 Pence the Quart, and White-wine at 1 *s.* or 12 Pence the Quart: Of theſe he would make a Mixture of 8 Gallons, or 32 Quarts, in ſuch ſort that one Quart may be afforded for 18 Pence. The Queſtion is, What Quantity of each ſort muſt be taken?

The ſeveral Rates being placed as in the Margin, and the Mean Rate on the Left Hand againſt the middle of the ſaid Rates; link together the greateſt and leaſt by a crooked Line or Arch, and alſo the next above the Common Rate with the next leſs than the Common Rate, and ſo the Work will ſtand as in the Margin.

18 { 24, 20, 16, 12 }

Nextly, Take the Difference between the Common Rate and each Particular Rate, which Difference place againſt the Number with which it is joyn'd.

		Differences
Mean Rate 18	24	6
	20	2
	16	2
	12	6
		16

So

So in this Example, the Difference between 24 and 18 being 6, place juſt againſt his reſpective Yoke-fellow 12; again, the Difference between 20 and 18 is 2, which muſt be placed againſt 16; again, the Difference between 16 and 18 is 2, which place againſt 20; and laſtly, the Difference between 12 and 18 being 6, place againſt 24 the Yoke-fellow of 12, and then the ſeveral Differences will be as in the Work before.

8. In *Allegation Total* the Proportion is,

As the Sum of the Differences,
to the Sum of the Quantities:
So is each particular Difference,
to the reſpective Quantity required.

So in the premiſed Example, the Sum of the Differences is 16, and the whole Mixture is 32. Therefore ſay,

As 16——32——6——12 *Canary,*
As 16——32——2—— 4 *Sherry.*
As 16——32——2—— 4 *Rheniſh.*
As 16——32——6——12 *Whitewine.*

So that by the aforegoing Proportions I find, that 12 Quarts of Canary, 4 Quarts of Sherry, 4 Quarts of Rheniſh, and 12 of Whitewine, being mixed together, may be afforded for 18 *d.* the Quart.

9. The Rule of *Allegation Partial* is, when one of the Quantities being given, the

the ſeveral Quantities of the reſt are required, in ſuch ſort that a Mixture made of the Quantities ſo found may bear a certain common Price propounded.

Example. A Man deſigns to mix 10 Buſhels of Oats at 24 Pence the Buſhel, with Barley at 28 Pence the Buſhel, with Rye at 46 Pence the Buſhel, and with Wheat at 60 Pence the Buſhel, to the end that a Mixture made of the aforeſaid Species may be afforded for 36 Pence the Buſhel. The ſeveral Rates being diſpoſed and linked as afore directed, the Work will ſtand as in the Margin. And having taken the ſeveral Differences of 60, 46, 28, and 24, to 36, and placed them againſt the reſpective Yoke-fellows of each Rate, proceed to the Operation by this Proportion.

36	60	12 *Wheat.*
	46	8 *Rye.*
	28	10 *Barley.*
	24	24 *Oats.*

As the Difference againſt the Rate whoſe Quantity is known,
To the ſaid Quantity:
So are the ſeveral remaining Differences,
To their Quantities required.

So in this Example, the Quantity of Oats given being 10 Buſhels, and the Difference annexed

annexed 24, the ſeveral Quantities are found as followeth.

As 24—10—*So is* 10—$4\frac{1}{6}$ *Barley.*
As 24—10—*So is* 8—$3\frac{1}{3}$ *Rye.*
As 24—10—*So is* 12—5 *Wheat.*

That is, If 10 Buſhels of Oats be mixed with 4 Buſhels and one ſixth part of a Buſhel of Barley, with 3 Buſhels and a third part of a Buſhel of Rye, and with 5 Buſhels of Wheat, a Buſhel of this Mixture may be afforded for 3 *s.* or 36 Pence.

10. The Proof of *Allegation*, whether *Medial* or *Alternate*, is by comparing the Total Value of the ſeveral Simples of which the whole Mixture is compoſed, with the Worth of the whole Mixture ſo compoſed; and if the Sums agree, the Work is right.

So in the firſt Example, in *Allegation Medial*, the Sum of the Values of the ſeveral Simples is 2186 Pence; and the Product of 56 (the Sum of the Quantities) multiplied by 39 (the Mean Price of one Buſhel) is 2184; to which adding the Remainder 2, the Sum is 2186, as before.

Likewiſe in the laſt Example, the Value of 10 Buſhels of Oats, at 24 *d.* the Buſhel, is 1 Pound; the Value of 4 Buſhels and one ſixth part of a Buſhel of Barley, at 28 Pence the Buſhel, is 9 *s.* 8 *d.* and two third parts of

of a Peny; the Value of 3 Buſhels and one third part of a Buſhel of Rye, at 46 Pence the Buſhel, is 12 *s.* 9 *d.* and one third part of a Peny; and the Value of 5 Buſhels of Wheat, at 60 Pence the Buſhel, is 1 *l.* 5 *s.* Theſe four Sums added make 3 *l.* 7 *s.* 6 *d.* So likewiſe the Value of 22 Buſhels and a half (the Total of the Quantities) at 36 *d.* (the Mean Price of one Buſhel of the whole Mixture) is 3 *l.* 7 *s.* 6 *d.* as before. Therefore I conclude the Work is true.

CHAP. XI.

Of the Rule of False Position.

1. THE Rule of *False* is that which teacheth us by Supposed or Feigned Numbers taken at pleasure, to discover the true Number demanded.

2. The Rule of *False* is either of *Single* or *Double Position.*

3. The Rule of *Single Position* is, when by one Feigned or Supposed Number we resolve the Question propounded.

Example: A Man dying leaves his Estate (which amounted to 120 *l.*) to be distributed amongst three Persons, *A. B.* and *C.* in such sort as followeth: *A.* was to have a Share unknown; *B.* was to have twice as much as *A.* and *C.* three times as much as *A.* What is the Share of each?

Suppose that *A.* must have 1 *l.* then must *B.* have 2 *l.* and *C.* 3 *l.* Now these three added together make but 6 *l.* which should be 120 *l.* Therefore I find the respective Shares by the following Proportions.

As 6 — 120 — 1 — 20 *l. A's Share.*
As 6 — 120 — 2 — 40 *l. B's Share.*
As 6 — 120 — 3 — 60 *l. C's Share.*

That is, *A.* must have 20 *l.* *B.* 40 *l.* and *C.* 60 *l.*

C. 60 *l.* Which Sums added together, make 120 *l.* the Sum propounded.

4. The *Double* Rule of *False* is, when we make use of two Feigned Numbers to resolve the Question by.

5. A Question belonging to the *Double Rule of False* being propounded, you must suppose one Number at pleasure, with which proceed as with the true Number; if it answer the Question, then your Work is done; if not, mark whether the Error be too much or too little, which place under the Supposition by which it was produced: Again, make a second Supposition, with which proceed as with the first, and place the Error proceeding, whether exceeding or defective, under its Supposition. Then multiply the first Supposition by the second Error, and the second Supposition by the first Error; and if the Errors be both of one kind, that is, both too much or both too little, the Difference of the Products found as before is your *Dividend*, and the Difference of the Errors your *Divisor*, by which dividing the aforesaid *Dividend*, the *Quotient* found is the Number required. But if the Errors be of divers kinds, that is, the one too much and the other too little, take the Sum of the two Products for your *Dividend*, which divided by the Sum of the

Errors, the *Quotient* proceeding is the Number required.

Example. A Man hath two Silver Cups of unequal weight, having to them both one Cover, weighing 5 Ounces: Now if the Cover be put upon the leſſer Cup, it will be in double proportion to the weight of the greater Cup; and the Cover being ſet to the greater Cup, it will be in triple proportion to the weight of the leſſer. What is the weight of each Cup?

To reſolve this, ſuppoſe that the weight of the leſſer Cup be 7 Ounces, then this with the Cover will weigh 12 Ounces: And becauſe this ſhould be double to the weight of the greater Cup, the greater muſt weigh 6 Ounces; this added to the weight of the Cover, *viz.* 5, makes 11 Ounces, which ſhould be in triple proportion to the weight of the leſſer Cup. Now 3 times 7 is 21, from which taking 11, I find 10 to be my firſt Error, too little, which I place under my Suppoſition 7, making a Croſs between them, as in the Margin.

10 15

90 105

90

5)15(3

15

00

Suppoſe again that the leſſer Cup weighed 9 Ounces, and proceeding with this as with

with the former, the ſecond Error is 15 too little, which being placed as before in the Margin, I multiply 7 the firſt Suppoſition by 15 the ſecond Error, and the Product is 105: Again, I multiply 9, the ſecond Suppoſition, by 10 the firſt Error, and the Product is 90. And laſtly, becauſe the Errors are alike, *viz.* both too little, I ſubſtract 90 from 105, and the Remainder is 15, which I divide by 5, the Difference of the Errors, and the *Quotient* is 3, the weight of the leſſer Cup. Now to find the weight of the greater Cup, I add 5, the weight of the Cover, to 3, the weight of the leſſer Cup, and the Sum is 8: And becauſe by the Queſtion the weight of the leſſer Cup, with the Cover added together, muſt be double the weight of the greater Cup, therefore half their Sum, *viz.* 4, muſt be the weight of the greater Cup.

Davy Drinan

first 2½ Bushels in Winter

2nd – 5 in may.

3rd – 2½ in Do

COLLINS's ARITHMETICK.

PART II.

Treating of Fractions.

CHAP. I.

Of Vulgar Fractions.

1. HAving in the First Part of this Book briefly treated of *Arithmetick in Whole Numbers*, I come now to the Parts or Fragments of Unity, called *Fractions*.

2. *Fractions* are either *Vulgar* or *Decimal*.

3. A *Vulgar Fraction* consisteth of two Parts, a *Numerator* and a *Denominator*, the one placed above and the other below a small Line.

So if three quarters of a Yard of Cloth were given to be expressed in a *Fraction*,

it muſt ſtand thus, $\frac{3}{4}$, that is, Three fourths.

4. The *Denominator* is the Number ſtanding beneath the Line, and ſheweth into how many Parts the Integer is divided.

5. The *Numerator* ſtandeth above the Line, and ſheweth how many of thoſe Parts the *Fraction* doth conſiſt of.

6. *Vulgar Fractions* are either *Simple* or *Compound.*

7. A *Simple Vulgar Fraction* is that which hath only one *Numerator* and *Denominator*, and is either *Proper* or *Improper.*

8. A *Proper Vulgar Fraction* hath always its *Denominator* greater than its *Numerator*: Such as theſe *Fractions*, $\frac{1}{2}, \frac{1}{4}, \frac{2}{3}, \frac{3}{4}, \frac{6}{7}$.

9. An *Improper Fraction* hath its *Denominator* leſs than its *Numerator*: Such as theſe *Fractions*, $\frac{3}{2}, \frac{5}{3}, \frac{8}{5}$, *&c.*

10. A *Compound Fraction*, or a *Fraction of a Fraction*, is that which conſiſteth of more *Numerators* and *Denominators* than one: As this *Fraction*, *Two thirds of five ſixths of eight fifteenths*, is to be written thus, $\frac{2}{3}$ of $\frac{5}{6}$ of $\frac{8}{15}$. Or if Five pence were given to expreſs in a *Fraction*, it would ſtand thus, $\frac{5}{12}$ of $\frac{1}{20}$.

CHAP.

CHAP. II.

Of the Reduction of Fractions.

1. *Reduction* of *Vulgar Fractions* is twofold, *viz.* into a *Common* or into the *Leaſt Denomination.*

2. Two or more *Fractions* of divers Denominations being given to be reduced to a *Common Denominator*, obſerve this Rule, *viz.* 1. Multiply each *Numerator* by all the *Denominators* (except its own) continually taking the reſpective *Products* for *New Numerators.* 2. Multiply all the *Denominators* continually, ſo ſhall the *Product* ariſing be a *New Denominator* common to all the *Numerators* found as before.

Example. To reduce $\frac{2}{3}$ and $\frac{1}{2}$ into one Denomination, firſt, I place the two *Fractions* as in the Margin: Then I multiply them croſs-wiſe, *i. e.* the firſt *Numerator* by the ſecond *Denominator*, and the ſecond *Numerator* by the firſt *Denominator*, and the *Products* are 3 and 4 for new *Numerators*; and laſtly, the *Denominators* multiplied

	2	3
	X	
	1	2
New Numer.	3	4
Com. Denom.	6	6

tiplied make 6 for a *Common Denominator.*

Another Example is, If $\frac{2}{5}$, $\frac{3}{7}$, and $\frac{8}{9}$ be given to be reduced to a *Common Denominator*, you muſt multiply 2 by 7, and the *Product* is 14, which multiplied by 9, the Reſult is 126 for the firſt *Numerator*; again, multiply 3 by 5, and the *Product* is 15, which multiplied into 9 makes 135 for the ſecond *Numerator*; again, 8 times 5 is 40, which multiplied by 7 makes 280 for the laſt *Numerator*: And laſtly, multiplying 5 by 7, the *Product* is 35, which multiplied into 9 makes 315 for a *Common Denominator* to the *New Numerators* found as before.

	$\frac{2}{5}$	$\frac{3}{7}$	$\frac{8}{9}$	
reduc't	126	135	280	*New Numerators.*
	315	315	315	*Denominator Com.*

3. To reduce a *Fraction* into its leaſt Denomination, is performed by finding its greateſt Common Meaſure, or the greateſt Number that will exactly divide both the *Numerator* and the *Denominator*, without any Remainder.

4. The greateſt Common Meaſure to the *Numerator* and the *Denominator* of a *Fraction* is found by dividing the *Denominator* by the *Numerator*, and the *Diviſor* by the *Remainder*

mainder. (if any be), and so proceeding with the rest, till nothing remain. Then is the last *Divisor* the *Common Measure* required. But if your last *Divisor* be 1, the *Fraction* is in its least Terms already. An Example or two will make it easie. 1. Let it be required to find the greatest *Common Measure* to $\frac{128}{144}$: 1. I divide 144 by 128, and there remains 16: Again, I divide the last *Divisor* 128 by 16 the *Remainder*, and there remains nothing: Therefore the last *Divisor* 16 is the greatest *Common Measure* to $\frac{128}{144}$, as was required.

Now dividing 128 by 16, the *Quotient* is 8; and dividing 144 by 16, the *Quotient* is 9. So is the *Fraction* $\frac{128}{144}$ reduced to its least Terms $\frac{8}{9}$.

128) 144 (1
128
16 (128 (8
128
000

A second Example is: Let it be required to reduce $\frac{13}{16}$ into its least Terms: First I divide 16 by 13, and there remains 3, by which dividing 13, the last Remainder is 1; which shews that the *Fraction* is in its least Terms already.

13) 16 (1
13
3) 13 (4
12
1) 3 (1
3
0

But

But when the *Numerator* and *Denominator* consist of Even Numbers, they may be abbreviated by continual halving or dividing them by 2, so long till an Unit remain in one or both of them. Thus if $\frac{12}{28}$ be given to be reduced to its least Terms, I take the half of 12, which is 6, for a *New Numerator*, and the half of 28, *viz.* 14, for a *New Denominator*. Again, the half of 6 is 3, and the half of 14 is 7. So will the *Fraction* $\frac{12}{28}$ be reduced to its least Terms $\frac{3}{7}$.

12	6	3
28	14	7

Or if the *Numerator* and *Denominator* end each with a Figure of 5 or Cypher, or the one with a 5 and the other with a Cypher, divide each of them by 5, and the respective *Quotients* proceeding shall be a *New Numerator* and *Denominator*.

Example. Let $\frac{250}{465}$ be given to be abbreviated: First, I divide 250 by 5, and the *Quotient* is 50. for a *New Numerator*; again I divide 465 by 5, and the *Quotient* is 93 for a *New Denominator*: So is the *Fraction* $\frac{250}{465}$ reduced into its least Terms $\frac{50}{93}$.

6. A *Compound Fraction*, or a *Fraction of a Fraction*, is reduced to a *Single Fraction* by multiplying all the *Numerators* continually for a *New Numerator*, and also all the *Denominators* for a *New Denominator*.

Example.

Example. If $\frac{2}{3}$ of $\frac{3}{5}$ were given to be reduced: First, I multiply 2 by 3, and the *Product* is 6 for a *New Numerator*; again, I multiply 3 by 5, and the *Product* is 15 for a *New Denominator*: So is $\frac{6}{15}$ equal to $\frac{2}{3}$ of $\frac{3}{5}$. So $\frac{7}{8}$ of $\frac{4}{5}$ of $\frac{5}{9}$ being reduced to a *Single Fraction* is $\frac{140}{360}$, which being abbreviated by the 5th. of this Chapter, is $\frac{7}{18}$.

$$\frac{7}{8}\left|\frac{4}{5}\right|\frac{5}{9}\left|\frac{140}{360}\right|\frac{7}{18}$$

7. A *Whole Number* is reduced to an *Improper Fraction*, either by setting the proposed *Whole Number* for the *Numerator*, and an Unite for the *Denominator*; thus 6 Integers may be reduced into $\frac{6}{1}$: Or else by assigning a *Denominator* to the Integers proposed, and multiplying them by the said *Denominator*, the Product is the *Numerator* to the said *Denominator*.

Example. If it were required to reduce 8 Integers into an *Improper Fraction*, whose *Denominator* shall be 4: I multiply 8 by 4, and the Product is 32 for a *Numerator* to the *Denominator* 4: So is the *Improper Fraction* $\frac{32}{4}$ equal to 8 Integers.

8. A *Mixt Number* is reduc'd into an *Improper Fraction* by multiplying the *Integral Number* by the *Denominator* of the Fractional Part, adding the Product to the *Numerator* of the *Fraction*. Thus $11\frac{4}{6}$ is reduc'd

reduc'd to the *Improper Fraction* $\frac{70}{6}$, by multiplying 11 by 6, and the Product thereof, *viz.* 66, being added to 4, makes 70, as before.

9. The Value of a *Fraction* is found by multiplying the *Numerator* of it by the Number of the Denomination next inferior, contain'd in the Integer, and dividing the *Product* by the *Denominator*.

Example. Let the Value of $\frac{4}{5}$ of a Pound *Sterling* be required: First, I multiply 4 the *Numerator* by 20 the Number of Units in the next inferior Denomination, *viz.* Shillings (contain'd in the Integer) and the Sum is 80; which divided by 5, the *Quotient* is 16 Shillings, equal to $\frac{4}{5}$ of a Pound.

CHAP. III.

Addition of Vulgar Fractions.

1. *Single Vulgar Fractions*, whether *Proper* or *Improper*, are added together by this Rule: If they have divers Denominators, reduce them to one Denomination by the Second of the laſt Chapter; then take the Sum of the Numerators for a New Numerator, keeping the ſame Denominator.

Example.

Example. Let $\frac{2}{3}$, $\frac{5}{2}$, and $\frac{4}{1}$ be given to be added together; first I reduce them to a Common Denominator, by the Second of the last, and then are they as in the Margin. Secondly, I add the Numerators together, and they make 43: Therefore the Sum of the aforesaid *Fractions* is $\frac{43}{6}$. And lastly, I divide 43 by 6, and the Quotient is $7\frac{1}{6}$, equal to $\frac{43}{6}$.

$\frac{4}{6}$	$\frac{15}{6}$	$\frac{24}{6}$

2. Two or more *Compound Fractions* being given to be added together, you must first reduce them into *Single Fractions* by the Sixth of the last Chapter: Secondly, Reduce them to one Denomination by the Second of the last Chapter: And lastly, Add them together by the First of this Chapter.

Example. Let it be required to add $\frac{1}{2}$ of $\frac{2}{5}$ of $\frac{8}{9}$ to $\frac{1}{3}$ of $\frac{3}{4}$ of $\frac{6}{10}$: First I reduce them to *Single Fractions*, and then they make $\frac{16}{90}$ and $\frac{18}{120}$, which being added together by the First of this Chapter, make $\frac{2950}{9000}$, which being abbreviated by the Fourth of the last Chapter is $\frac{59}{180}$.

CHAP.

CHAP. IV.

Subſtraction of Vulgar Fractions.

Subſtraction of *Vulgar Fractions* is performed as *Addition*, if in ſtead of the Sum of the Numerators you take the Difference of them, ſtill keeping the Common Denominator.

Example. Let it be required to ſubſtract $\frac{3}{4}$ from $\frac{5}{6}$: The *Fractions* being reduc'd to a Common Denominator by the Second of the Second Chapter, make $\frac{18}{24}-\frac{20}{24}$. Now taking 18 from 20, the Difference is 2, which being placed over the Common Denominator 24, ſhews the difference of $\frac{3}{4}$ and $\frac{5}{6}$ to be $\frac{2}{24}$.

CHAP. V.

Multiplication of Vulgar Fractions.

THe *Fractions* being reduc'd into a *Single Fraction*, if need be, multiply the Numerator of the Multiplicand by the Numerator of the Multiplicator, and the Denominator of the Multiplicand by the Denominator of the Multiplicator: So are the reſpective

respective Numbers proceeding the Numerator and Denominator of the Product required.

Example. Let it be required to multiply $\frac{2}{3}$ by $\frac{1}{4}$: First, I multiply the Numerators together, and they make 6 for a New Numerator. Secondly, I multiply the Denominators together, and they make 12 for a New Denominator. So is $\frac{6}{12}$ or $\frac{1}{2}$ the Product of $\frac{2}{3}$ multiplied by $\frac{1}{4}$.

CHAP. VI.

Division of Vulgar Fractions.

ONe *Fraction* being given to be divided by another, you must prepare them for Operation as in *Multiplication, viz.* If one or both be Compound, reduce them to a Single *Fraction* or *Fractions* by the Sixth of the Second Chapter; then multiply the Numerator of the Dividend by the Denominator of the Divisor, and the Product arising is the Numerator of the Quotient. Again, Multiply the Numerator of the Divisor by the Denominator of the Dividend, and the Product is the Denominator of the Quotient.

Example.

Example. Let it be required to divide $\frac{1}{2}$ by $\frac{2}{3}$: First place the Diviſor on the Left Hand of the Dividend, with a Croſs between them, as in the Margin; then mul iply 3 the Diviſors Denominator, by 1 the Numerator of the Dividend, and the Product is ſtill 3, which place above the Croſs for the Numerator of the Quotient. Again, Multiply 2, the Diviſors Numerator, by 2 the Denominator of the Dividend, and the Product is 4, which place under the Croſs for a New Denominator: So will the Quotient be $\frac{3}{4}$.

CHAP. VII.

Of DECIMAL FRACTIONS.

1. A *Decimal Fraction* differs from a *Vulgar Fraction* in this, That the Denominator of a Common *Fraction* is expreſs'd, and the Denominator of a *Decimal* implied.

2. The Numerator of a *Decimal* is expreſt as a Whole Number, and always contains one Place leſs than the Denominator.

3. The Denominator of a *Decimal* is a Number conſiſting of a certain Number of Tens

Tens encreasing in a Geometrical Proportion, the Value of which is exhibited by a Point or Prick (with Cyphers, if need be) prefixed to the Numerator. Thus $\frac{5}{10}$ is expres'd in this manner, ,5 | $\frac{5}{100}$ thus ,05, and $\frac{35}{1000}$ thus, ,035.

4. A *Decimal Fraction* may be understood as a Whole Number, if in the numbring of them you observe the contrary Order, *viz.* That as Whole Numbers encrease by Ten times from Unity to the Left hand, so *Decimals* decrease in the same proportion from Unity to the Right Hand, as you may see by the following Tables.

A								B							
9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9
100 of Millions	10 of Millions	Millions	100 of 1000	10 of 1000	Thousands	Hundreds	Tens		Primes	Seconds	Thirds	Fourths	Fifths	Sixths	Sevenths	Eighths

The Table A signifies Integers, and the Table B Parts of Integers. Thus the Figure 2 in the Table A signifies 2 Tens, or twice 10 Units: But the Figure 2 in the Table B signifies but 2 Primes, or $\frac{2}{10}$ of Unity. The like is to be understood of any other *Decimal Fraction.*

CHAP.

CHAP. VIII.

Reduction of Vulgar Fractions to Decimal.

1. HAving in the laſt Chapter treated of the Notation of *Decimals*, I ſhall now ſhew how they are reduc'd.

2. *Reduction* of *Decimals* is either from Common *Fractions*, or into ſome known Denomination given.

3. A *Vulgar Fraction* is reduc'd into a *Decimal Fraction* by this Proportion.

As the Denominator of any Fraction,
To its Numerator:
So is any other Denominator aſſigned,
To its reſpective Numerator.

Example. Let it be required to find the *Decimal* of $\frac{3}{4}$; and let the Denominator aſſigned be 100: Say,

As 4—3—100 : 75.

So that the *Decimal* of $\frac{3}{4}$ is ,75, that is $\frac{75}{100}$.

So if it were required to find the *Decimal* of 8 *s.* that is $\frac{8}{20}$ of a Pound, ſay,

As 20 : 8 :: 10 : 4.

So that I find the *Decimal* required to be $\frac{4}{10}$,4.

Again,

Again, Let it be required to find the *Decimal* of 6 *d.* that is, $\frac{1}{2}$ of $\frac{1}{20}$: Firſt I reduce them to a *Single Fraction*, and they make $\frac{1}{40}$: Then I ſay,

As 40 : 1 :: 1000 : 25.

The *Decimal* whereof I find to be $\frac{25}{1000}$, in a *Decimal* thus ,025.

The like may be perform'd by Weights, Meaſures, *&c.*

After this Order theſe following Tables are framed; wherein obſerve the Figures that ſtand towards the Left Hand, in the place of Thouſands and Ten thouſands; but the Figures which ſtand to the Right Hand you may ſometimes cut off by way of Abbreviation.

075100

A Table

A Table of Decimal Fractions for English Money, the Pound or 20 s. being divided into 100000 parts.

sh.	*parts.*	*d.*	*q.*	*parts.*	*d.*	*q.*	*parts.*
19	95000	11	3	04895	5	3	02325
18	90000	11	2	04791	5	2	02201
17	85000	11	1	04687	5	1	02187
16	80000	11	0	04583	5	0	02083
15	75000	10	3	04479	4	3	01979
14	70000	10	2	04375	4	2	01875
13	65000	10	1	04271	4	1	01771
12	60000	10	0	04167	4	0	01667
11	55000	9	3	04062	3	3	01562
10	50000	9	2	03958	3	2	01458
9	45000	9	1	03854	3	1	01354
8	40000	9	0	03750	3	0	01250
7	35000	8	3	03645	2	3	01145
6	30000	8	2	03541	2	2	01041
5	25000	8	1	03437	2	1	00937
4	20000	8	0	03333	2	0	00833
3	15000	7	3	03229	1	3	00729
2	10000	7	2	03125	1	2	00625
1	05000	7	1	03021	1	1	00521
		7	0	02917	1	0	00417
		6	3	02812	0	3	00312
		6	2	02708	0	2	00208
		6	1	02604	0	1	00104
		6	0	02500	0	0	00000

A Table

A Table of Reduction to bring Averdupoiz great Weight into Decimals, the 112 *l. being* 100000 *parts.*

l.	*Decim.*	*l.*	*Decim.*	*oz.*	*Decim.*
56	50000	13	11607	15	00837
28	25000	12	10714	14	00781
27	24107	11	09821	13	00725
26	23214	10	08929	12	00670
25	22321	9	08036	11	00614
24	21429	8	07143	10	00558
23	20536	7	06250	9	00502
22	19643	6	05357	8	00446
21	18750	5	04464	7	00391
20	17857	4	03571	6	00335
19	16964	3	02679	5	00279
18	16071	2	01786	4	00223
17	15179	1	00893	3	00167
16	14286			2	00112
15	13393			1	00056
14	12500			½	00028

Averdupoiz little Weight, the pound 100000 *parts.*

oz	*Decim.*	4	25000	8	03125
15	93750	3	18750	7	02734
14	87500	2	12500	6	02344
13	81250	1	06250	5	01953
12	75000	*Drams.*		4	01522
11	68750	15	05859	3	01172
10	62500	14	05469	2	00781
9	56150	13	05078	1	00391
8	50000	12	04687	*q.*	*Drams*
7	43750	11	04297	3	00293
6	37400	10	03906	2	00195
5	31250	9	03516	1	00098

Table

Each of the aforegoing Tables is divided into six Columns: In the first Column of the first Table is exhibited the respective number of Shillings, and in the second Column are the corresponding *Decimals*; in the third and fifth Columns are the Pence and Farthings under a Shilling, and their *Decimals* in the fourth and sixth Columns. The like is to be understood of the rest.

Example. Let the *Decimal* of 7 *s.* be required; looking in the first Column of the first Table for 7 *s.* the Number in the second Column corresponding is ,35000, *viz.* $\frac{35000}{100000}$, which is the *Decimal* of 7 *s.* So if the *Decimal* of 10 Ounces *Averdupoiz* were required, look in the first Column of the third Table for 10, and the Number answering in the second Column is ,62500, the *Decimal* desired.

4. The Value of a *Decimal Fraction* in the given Parts of an Integer, may be found by multiplying it by the Number of the given Parts of the next inferior Denomination contain'd in the Integer, cutting off as many Figures towards the Right Hand of the Product, as are Places in the given *Decimal*: The Figures remaining toward the Left Hand are the Value of the *Decimal Fraction* propos'd, reduc'd into the Parts of the lower Denomination: And the Figures cut

cut off being multiplied by the Number of the Parts of the next inferior Denomination, and cut off as before, exhibits it Value in the ſaid Denomination.

Example. Let the Value of this *Decimal* ,758 be required in the known Parts of a Pound. ,758 being multiplied by 20, the Product is 15160, from which cutting three Figures to the Right Hand, the remaining Figures are 15 *s.* and 160 Parts of a Shilling. Again, multiplying 160 by 12, the Product is 1920, from which cutting off three Figures as before, there is 1 *d.* and 920 parts of a Peny: And laſtly, multiplying 920 by 4, the Product is 3680, from which cutting off three Figures, there is 3 Farthings and 680 *Decimal* parts of a Farthing: So that the whole Value of ,758 of a Pound, is 15 *s.* 1 *d.* 3 *f.* and above half a Farthing more.

758
20
15160
12
320
160
1920
4
3680

CHAP. IX.

Of the Addition and Subſtraction of Decimals.

Addition and *Subſtraction* of *Decimals* differs in nothing from the ſame Work in *Whole Numbers*: Only obſerve, That (if there be *Whole Numbers* prefixed to one or more of the Numbers given to be added or ſubſtracted, and you carry or borrow one or more Tens from the place of Primes) you add or ſubſtract the Tens ſo carried or borrowed to or from the place of Units in the Whole Number.

Example. Let it be required to add the *Decimals* in the Margin together. The Sum of all the *Fractions* is 1,768, which added to 38 the Sum of the Integers, makes the Total to be 39,768.

12,121
10,091
00,610
16,946
39,768

Examp. 2. If it be required to ſubſtract 4,671 from 71,589; their Difference will be found to be 66,918. See the Work.

71,589
4,671
66,918

CHAP.

CHAP. X.

Of the Multiplication and Diviſion of Decimals.

1. ONe *Decimal Fraction* being given to be multiplied by another, you muſt proceed to find the *Product* as in *Whole Numbers*, cutting off as many Places towards the Right Hand of the *Product* as are Figures in the Fractional part of both the Factors: So are the Figures towards the Left Hand Integers, and the Figures cut off the Decimal parts of an Integer. Thus if ,524 were given to be multiplied by ,48, the Product would be found to be ,25152 parts of an Integer.

,524
,48
,4192
,2096
,25152

2. If one *Decimal* be given to be divided by another, you muſt make your Diviſion as in *Whole Numbers*: And the Value of the *Quotient* proceeding may be found by this Rule, from Dr. *Newton*.

The firſt Figure in your Quotient will be always of the ſame Degree or Place with that Figure or Cypher in your Dividend which ſtandeth over the Place of Units in the Diviſor.

Example. Let it be required to divide ,3658 by ,25, and exhibit the Value of the *Quotient*: Diviſion being made as in *Whole Numbers*, the *Quotient* is 14632. Now to find the Value of it, I ſubſcribe the *Diviſor* under my firſt *Dividual*, and I find that the place of Units in my *Diviſor* ſtands under the place of Units in my *Dividual*: Therefore I conclude the Figure 1 in my *Quotient* to be an Integer, which being ſeparated from the reſt, makes the *Quotient* to be 1 ,4632.

0,25) 0,3658 (1,4632
0,2500

CHAP. XI.

The Rule of Three in Fractions.

1. THe *Rule of Three* in *Fractions* differs little from the *Rule of Three* in *Whole Numbers*, and is either *Direct* or *Inverſe*.

2. When a Queſtion of Broken Numbers belonging to the *Direct Rule of Three* is propoſed, this is the Rule. Multiply the Denominator of the firſt Fraction into the Numerator of the ſecond Fraction, and that Product into the Numerator of the third Fraction;

Fraction; ſo is the Product laſt found the Numerator of the fourth Number ſought. Secondly, Multiply the Numerator of the firſt Fraction into the Denominators of the ſecond and third Fractions continually, and the Product is a Denominator to the Numerator found, as before.

3. But in the *Inverſe Rule of Three*, multiply the Numerator of the firſt Fraction into the Numerator of the ſecond Fraction, that Product again into the Denominator of the third Fraction; then is the laſt Product a new Numerator. Secondly, Multiply the Denominator of the firſt Fraction into the Denominator of the ſecond Fraction, and that Product into the Numerator of the laſt Fraction; ſo is the Product a new Denominator.

Example. If $\frac{2}{3}$ of any Weight or Meaſure be worth $\frac{4}{5}$ of 20 *s.* or of any other Sum, what are $\frac{7}{8}$ of the like Weight or Meaſure worth after that Rate?

Firſt, I multiply the Numerators of the ſecond and third Fractions the one by the other, that is, 7 by 4, and they make 28: Again, I multiply the ſaid 28 by the Denominator of the firſt Fraction, by 3, and thereof cometh 84, which 84 I ſet over the Croſs for my Dividend.

Secondly, I multiply the Denominators of the ſecond and third Fractions, namely, 8 by 5, and they make 40; again, I multiply the ſaid 40 by the Numerator of the firſt Fraction by 2, and thereof cometh 80; the ſame 80 I ſet under the Croſs for my Diviſor.

Then I divide 84 by 80, and there cometh in the Quotient 1 *l.* and $\frac{4}{80}$ remaining, which $\frac{4}{80}$ abbreviated maketh $\frac{1}{20}$ of a Pound, worth 12 *d.* And ſo much will the aforeſaid $\frac{7}{8}$ coſt, as here appears.

$$\begin{array}{ccc} & 84 & \\ \frac{2}{3} & \times & 5 \quad \frac{7}{8} \\ & 80 & \end{array} \qquad \begin{array}{r} 7 \\ 4 \\ \hline 28 \\ 3 \\ \hline 84 \end{array} \qquad \begin{array}{r} 8 \\ 5 \\ \hline 40 \\ 2 \\ \hline 80 \end{array} \qquad \begin{array}{l} 84\,(1\ \frac{4}{80} \\ 80 \end{array}$$

If this were reduced into *Decimals*, the Work would be performed juſt as in *Whole Numbers.*

$$\begin{array}{cccccc} \frac{2}{3} & \frac{4}{5} & & \frac{7}{8} & & \\ 0{,}667 & 0{,}800 & :: & 0{,}875 & & 1{,}050 \\ & & & 800 & & \\ \hline & & & 700000 & & \end{array}$$

667) 700000 (1,050 *fere*, which is 1 *l.* 1 *s.*

CHAP.

CHAP. XII.

Of SIMPLE INTEREST.

1. A Sum of Money being lent by one Man to another, and a Consideration allowed by the Borrower for the Forbearance or Continuance of it in his Hands, Keeping, or Possession; the Sum so forborn is call'd the *Principal*, and the Money or other valuable Consideration allowed by the Debtor is call'd the *Use* or *Interest*. And in these kind of Operations doth the Use of *Decimal Fractions* chiefly consist.

2. *Interest* is either *Simple* or *Compound*.

3. *Simple Interest* is when the *Use* for the several Terms of Forbearance becoming due and unpaid, is yet continued in the Hands of the Debtor, without any *Interest* repaid for the Forbearance of it. As if 100 *l.* be put out for 3 Years, after the rate of 6 *l.* for one Year, 'tis evident, that there will be due at the end of the first Year 106 *l.* This continued in the Hands of the Debtor another Year, there will then be due 112 *l.* which being forborn the third Year, there will be due 118 *l.*

4. By this Proportion may the *Interest* be computed for any Sum of Money less or

more than 100 *l.* forborn for any Term leſs or more than one Year, at any Rate of *Intereſt* propos'd, either by *Two Single Rules of Three*, or by the *Rule compos'd of Five Numbers*, taught in the Eighth Chapter of the Firſt Part of this Book.

Example. Let it be required to find the *Intereſt* of 225 *l.* for 7 Years, after the Rate of 5 *l. per Cent. per Ann. Simple Intereſt*: Firſt find the *Intereſt* of 225 *l.* for 1 Year by this Proportion.

	l.	*l.*	*l.*	*l.*
As	100 :	5 : :	225 :	11,25.

So that 225 *l.* will gain 11 *l.* 5 *s.* in 1 Year. Now to find how much it will gain in 7 Years, ſay again,

	Year.	*l.*		*Years.*	*l.*	*s.*
As	1 :	11,25	: :	7 :	78	15

By which I find, that 225 *l.* will gain 78 *l.* 15 *s.* in 7 Years, at the aforeſaid Rate of *Intereſt*

5. But to do this at one Operation, take this general Rule: Multiply the Principal Sum, the Term of Years, and the Rate of *Intereſt* continually, from which Product cut off two Figures towards the Right Hand; ſo ſhall the Figures to the Left Hand be Pounds, and thoſe on the Right Hand the

the Decimal Parts of
note, "That if the sa
"Number, to cut off t
"from the Integral Pa
"Cypher or Cyphers (if
"Hand of the aforesaid

Example. Let the afo
repeated, and the Intere
Years, at 5 *l. per Cent.*
manded. First I multiply
cipal) by 7 (the Term of
Product is 1575; which mu
Rate of Interest) the Produc
which cutting off two Figu
Right Hand, there remains
Decimal Parts, equal to 15 *s.*
ing with my former Operation
the Work is right.

Principal 225
Years—— 7
1575
Rate of Int. 5
78,75 *or* 15 *s.*

Another Example is: Let the Inte
1 *l.* for 1 Day be required, Simple In
being computed at 6 *per Cent. per Ann*

l. *l.* *l.*
First say, *As* 100 : 6 : : 1 : ,06

l. *Day.*

: ,06 : : 1 : 0001645

e Interest of 1 *l.* for 1

fere.

nple be this. What is the

or 146 Days, Simple In-

ted at 6 *per Cent. per An.*

l. *l.* *l.* *l.* *s.*

00 : 6 : : 315 : 18 18

l. *s.* *Days.* *l.* *s.* *d.* *f.*

: 18 18 : : 146 : 7 11 2 1

he Interest of 315 *l.* for 146

. 11 *s.* 2 *d.* 1 *f.* *fere.*

ay to perform the last Question

er of the same Nature) is this:

Number of Days propos'd, which

mple is 146, by 365, the Num-

ys in a Year, and the Quotient

4; which is the Decimal Part of a

responding to 146 Days. Now if

first Example of this Section you

ly 315 (the Principal Sum) by ,4 of

of a Year (the time of Continuance) the Product will be 126,0; which multiplied by 6 (the Rate of Interest)

ipal 315

,4

126,0

of Int. 6 *s.* *d.* *f.*

7,56 *or* 11 2 1

nterest) the Product will be 756; from which cutting off two Places towards the Right Hand, there will remain, 7 *l.* 11 *s.* 2 *d.* 1 *f. fere*, as before.

6. *Rebate* or *Diſcount* is, when a Sum of Money is due hereafter, and the Creditor receiveth preſent Payment for it, allowing the Debtor ſo much *per Cent. per Ann.* for the Intereſt of his Money: As if 106 *l.* be due at the end of a Year, or 12 Months, and the Creditor is willing to have preſent Satisfaction, allowing the Debtor 6 *l. per Cent. per Ann.* for the Uſe of his Money; 'tis evident, that ſuch a preſent Sum of Money ought to be paid, as being put out to Intereſt at 6 *l. per Cent.* would in 12 Months be augmented to 106 *l.* which in this Example I find to be 100 *l.* for if 100 *l.* be put out for a Year at 6 *l. per Annum*, it will then be encreas'd to 106 *l.* So likewiſe if 106 *l.* be due at the end or Expiration of one Year, and the Creditor takes 100 *l.* for preſent Satisfaction of the whole Debt, 'tis evident, that if you compute the Intereſt of 100 *l.* for one Year at 6 *per Cent.* its Intereſt will be 6 *l.* the Sum rebated by the Debtor.

7. By a right underſtanding of what hath been ſaid, may the Intereſt of any other Sum be rebated, if you add 100 to the Rate of Intereſt, the Sum whereof muſt always be

your

your firſt Term, 100 *l.* the ſecond, and the Sum given to be rebated the third.

Example. There is 160 *l.* due at the end of one Year; how much preſent Money will ſatisfie the ſaid Debt, Rebate or Diſcount being allowed at 5 *per Cent. per Annum*? To do this, ſay by the Rule of Proportion,

	l.	*l.*	*l.*	*l.*
As	105	: 100 : :	160	: 152,381

By which Analogy I find its preſent Worth to be 152 *l.* 7 *s.* 7 *d.* $\frac{1}{2}$ *fere.*

Let another Example be this: How much preſent Money is 525 *l.* 10 *s.* worth, due at the end of 5 Years, Rebate or Diſcount being allow'd at 6 *l. per Cent. per Annum*? Firſt find the Intereſt of 100 *l.* forborn 5 Years, by this Proportion;

	Year.	*l.*	*Years.*	*l.*
As	1	: 6 : :	5	: 30

Having found the Intereſt of 100 *l.* for 5 Years to be 30 *l.* add it to the Principal by which it was produc'd, *viz.* 100, and the Sum is 130. Then ſay,

	l.	*l.*	*l.*	*l.*	*s.*	*d.*	*f.*
As	130	: 100 : :	525,5	: 404	4	7	1

By which Operation I find that the preſent Worth of 525 *l.* 10 *s.* due at the end of 5 years, is 404 *l.* 4 *s.* 7 *d.* 1 *f. fere.*

CHAP.

CHAP. XIII.

Of COMPOUND INTEREST.

1. *Compound Intereſt*, or *Intereſt upon Intereſt*, is when a Sum of Money being put out to Uſe, and the Intereſt thereof becoming due and unpaid, is continued in the Hands of the Debtor, and continually added to the Principal as it becomes due. As, if 100 *l.* be put out to Intereſt at 6 *per Cent. per Ann.* 'tis evident there will be due the firſt Year 106 *l.* This continued in the Hands of the Debtor the ſecond Year, there will then be due the Encreaſe of 106 *l.* *viz.* 112,36 *l.* Again, This forborn the third Year, there will then be due the Amount of 112,36 *l.* for one Year, *viz.* 119,101 *l.* Which forborn the fourth Year, will be encreas'd to 126,2477 *l.* as by the following Work appears.

Years.	*l.*			*l.*
1				106
2	100 :	106 : :	106	: 112,36
3	100 :	106 : :	112,36	: 119,101
4	100 :	106 : :	119,101	: 126,2477

From which it is obvious, that by the continual

tinual Addition of the Sums of Intereſt for the ſeveral Terms of Forbearance, ariſeth a Series of Geometrical Proportionals, more in number by one than the Terms of Continuance, and encreaſing by ſuch Proportion as 106 hath to 100 *l.* For ſuch Proportion as 100 (the firſt Proportional) hath to 106 (the ſecond Proportional), ſuch Proportion hath any other Proportional to the Number immediately following it.

2. By a right underſtanding of the Premiſſes, 'tis eaſie to determine the Encreaſe or Amount of any other Sum more or leſs than 100 *l.* forborn any term of Years propos'd, by finding a Number of Geometrical Proportionals equal to the Terms of Forbearance, proceeding from the propos'd Principal, in ſuch Proportion as the Rate of Intereſt added to 100, proceeds from 100: So ſhall the laſt Proportional be the Encreaſe required.

Example. Let it be required to find the Encreaſe of 252 *l.* being forborn 7 Years, Compound Intereſt being computed at 5 *l.* *per Cent. per Ann.* Here, according to the foregoing Directions, the Proportionals are found by this Analogy;

As 100, *is to* 105:
So is 252, *the Principal, to a ſecond Proportional.*

Again,

Again,

As the firſt Proportional, is to the ſecond:
So is the ſecond to the third.

And ſo proceeding with the reſt, you ſhall find the eighth Proportional to be 354,585 *l.* And ſo much is the Amount or Encreaſe of 252 *l.* being forborn 7 Years. See the Work.

	l.		*l.*		*l.*	*Years*
	100	: 105	: : 252	:	264,6	—1.
	100	: 105	: : 264,6	:	277,83	—2
	100	: 105	: : 277,83	:	291,72	—3
As	100	: 105	: : 291,72	:	306,306	4
	100	: 105	: : 306,306	:	321,62	—5
	100	: 105	: : 321,62	:	337,7	—6
	100	: 105	: : 337,7	:	354,585	-7

And after this manner is calculated the following Table, ſhewing the Intereſt of 1 *l.* forborn any number of Years under 21; and at any Rate of Compound Intereſt, from 5 to 10 *per Cent.*

A Table

Table 1. *shewing the Amount or Increase of* 1 *l. being forborn any number of Years under* 21; *Compound Interest being computed at* 5, 6, *and* 7 per Cent.

Years.	5	6	7
1	1,05000	1,06000	1,07000
2	1,10250	1,12360	1,14490
3	1,15762	1,19101	1,22505
4	1,21550	1,26247	1,31080
5	1,27628	1,33822	1,40255
6	1,34009	1,41851	1,50073
7	1,40710	1,50363	1,60578
8	1,47745	1,59384	1,71818
9	1,55132	1,68947	1,83845
10	1,62889	1,79084	1,96715
11	1,71033	1,89829	2,10485
12	1,79585	2,01219	2,25219
13	1,88564	2,13292	2,40984
14	1,97993	2,26090	2,57853
15	2,07892	2,39655	2,75903
16	2,18287	2,54035	2,95216
17	2,29201	2,69277	3,15881
18	2,40661	2,85433	3,37993
19	2,52695	3,02559	3,61653
20	2,65329	3,20713	3,86968

A Continuation of the former Table, shewing the Amount or Increase of 1 l. *being forborn any number of Years under* 21, *at* 8, 9, *and* 10 l. per Cent.

Years.	8	9	10
1	1,08000	1,09000	1,10000
2	1,16640	1,18810	1,21000
3	1,25971	1,29502	1,33100
4	1,36048	1,41158	1,46410
5	1,46932	1,53862	1,61051
6	1,58687	1,67710	1,77156
7	1,71382	1,82803	1,94871
8	1,85093	1,99256	2,14358
9	1,99900	2,17189	2,35794
10	2,15892	2,36736	2,59374
11	2,33163	2,58042	2,85311
12	2,51817	2,81266	3,13842
13	2,71962	3,06580	3,45227
14	2,93719	3,34172	3,79749
15	3,17216	3,64248	4,17724
16	3,42594	3,97030	4,59497
17	3,70001	4,32763	5,05447
18	3,99601	4,71712	5,55991
19	4,31570	5,14166	6,11590
20	4,66095	5,60441	6,72749

The Uſe of the preceding Table.

IN the top Column are expreſs'd the ſeveral Rates of Intereſt from 5 to 10 *per Cent*, and in the ſide Column are expreſs'd the Numbers of Years from 1 to 20, and in the common Angle of Concurrence is exhibited the Encreaſe or Amount of 1 *l.* being forborn ſo many Years, and at ſuch a Rate of Intereſt as is there expreſſed.

Example. Let it be required to find the Increaſe of 1 *l.* forborn 7 Years, at 8 *l. per Cent. per Ann.* Compound Intereſt. Looking in the top Column for 8 *l.* (the Rate of Intereſt), and in the ſide Column for 7 Years, in the Angle of Concurrence I find 1,71382, and ſo much is the Increaſe of 1 *l.* forborn 7 Years, at the premiſed Rate of Intereſt. Now to find the Amount of any other Sum, firſt find the Amount of 1 *l.* for the time and at the rate of Intereſt propoſed, by which multiply the propoſed Principal; ſo ſhall the Product be its Increaſe for the time and at the Rate of Intereſt for which the Increaſe of 1 *l.* was reckon'd.

1 *Example.*

What will be the Amount of 270 *l.* 10 *s.* being forborn 16 Years, Compound Intereſt being

being computed at *6 l. per Cent. per Annum?* Firſt find 6 in the top Column, and 16 in the ſide Column, and in the Angle of Meeting you ſhall find 2,54035, which is the Encreaſe of 1 *l.* forborn 16 Years at *6 per Cent.* Secondly, Multiply the Principal propoſed, *viz.* 270,5, by the Tabular Number found, and the Product is 687,164675, and ſo much is the Amount of 270 *l.* 10 *s.* being forborn 16 Years, at *6 per Cent.* For,

As 1 : 2,54035 :: 270,5 : 687,164675

	270,5
	1270175
	1778245
	508070
	687,164675

Example 2.

What is the Encreaſe or Amount of 721 *l.* 15 *s.* being forborn 20 Years, Compound Intereſt being compured at 9 *l. per Cent. per Annum?* The Tabular Number for 1 *l.* forborn the time and at the Rate of Intereſt propos'd, is 5,60441, by which multiplying 721 *l.* 15 *s.* the Product is 4044,9829; and ſo much is the Encreaſe of 721 *l.* 15 *s.* forborn 20 Years, at 9 *per Cent.* For,

As

	l.	*l.*	*l.*	
As	1	: 5,60441	:: 721,75	: 4044,9829

72175

2802205
3923087
560441
1120882
3923087

4044,9829175

3. When a Sum of Money is due hereafter, and it is demanded how much preſent Money will ſatisfie the ſame, allowing the Debtor a certain Rate of Compound Intereſt: This is the Converſe of the Firſt and Second of this Chapter: Therefore find a Series of Geometrical Proportionals, one more in number than the term of Years propos'd, decreaſing from the Sum to be rebated in ſuch Proportion as 100 *l.* decreaſes from 100 *l.* and the Rate of Intereſt added together; ſo ſhall the laſt Proportional be the preſent Worth demanded.

Example. How much preſent Money will ſatisfie a Debt of 520 *l.* due at the end of 4 Years, Rebate being allowed at 6 *per Cent. per Ann.* Compound Intereſt? Say, *As* 106 *is to* 100; *ſo is* 520 *l. to* 490,566; and ſo much is due at the end of 3 Years. Again,

As

As 106 *is to* 100; *ſo is* 490,566 (the Money due at the end of 3 Years) *to* 462,789; and ſo much is there due at the end of 2 Years, *&c.* And ſo proceeding with the reſt, you'll find the fifth Proportional to be 412,066; and ſo much Money will ſatisfie the aforeſaid Debt, as by the following Work appears.

	l.	*l.*	*l.*	*Years.*
		520	: 490,566 —	3
As 106	: 100 ::	490,566	: 462,798 —	2
		462,798	: 436,790 —	1
		436,790	: 412,066 —	0

4. But the preſent Worth of any Sum of Money due hereafter, may more eaſily be diſcovered by the aforegoing Table, thus: Find the Amount of 1 *l.* for the Time and at the Rate of Intereſt propos'd, by which divide the given Principal, ſo ſhall the Quotient proceeding be the Decreaſe or preſent Worth of the ſaid Principal.

1 *Example.*

What preſent Sum is 251 *l.* 15 *s.* worth, being due at the end of 13 Years, Rebate or Diſcompt being allow'd at 5 *l. per Cent. per Ann.* Compound Intereſt?

Looking

Looking in the preceding Table, I find the Amount of 1 *l.* forborn 13 Years, at 5 *l. per Cent.* to be 1,88564; by which dividing 251,75 *l.* the Quotient is 133,5082; and ſo much preſent Money is 251 *l.* 15 *s.* due at the end of 13 Years worth. For,

	l.		*l.*		*l.*
As	1,88564	:	1	: :	251,75 : 133,5082

2 *Example.*

If 115 *l.* 7 *s.* 6 *d.* be due at the end of 19 Years, how much preſent Money is it worth, Rebate being allow'd at 5 *l. per Cent. per Ann.* Compound Intereſt? The Amount of 1 *l.* for the time, and at the rate of Intereſt propoſed by the preceding Table, is 2,52695; by which dividing the aforeſaid Sum, the Quotient is 45,6578; and ſo much is the preſent Worth of 115 *l.* 7 *s.* 6 *d.* For,

	l.		*l.*		*l.*
As	2,52695	:	1	: :	115,375 : 45,6578

5. When it is required to find the utmoſt Encreaſe or Amount of an Annuity or yearly Payment, being in Arrear, allowing to the Creditor a certain Rate of Compound Intereſt:

Intereſt: Firſt, find a Series of Geometrical Proportionals, equal in number to the Term of Years propoſed, encreaſing from the propounded Annuity in ſuch Proportion as 100 added to the Rate of Intereſt encreaſes from 100. Secondly, add the ſaid Proportionals together, ſo ſhall their Aggregate be the utmoſt Improvement of the Annuity propos'd.

Example. There is an Annuity of 70 *l. per Annum* in Arrear, for 4 Years, and the Creditor deſires to know the utmoſt Amount or Improvement of it for the ſaid time, Compound Intereſt being allowed at 6 *l. per Cent. per Ann.* Here 'tis evident there muſt be firſt computed the Amount of 70 *l.* forborn 3 Years, *viz.* the Rent due at the end of the firſt Year, and continued in the Debtors Hands till the end of the fourth Year: Secondly, there muſt be reckoned the Encreaſe of 70 *l.* for 2 Years, *viz.* the Rent due at the end of the ſecond Year. Again, there muſt be computed the Encreaſe of 70 *l.* for one Year, *viz.* the Rent due at the end of the third Year; and laſtly, the Annuity it ſelf, *viz.* the Rent due at the end of the fourth Year, for which no Intereſt muſt be accounted. The Total of which four Sums is the Improvement of the propoſed Annuity.

		l.	
As 100 : 106 : :		70	: 74,2
		74,2	: 78,852
		78,852	: 83,583
			70,0
			306,635

By the foregoing Work I find the utmoſt Improvement of 70 *l. per Ann.* being in arrear for 4 Years, to be 306 *l.* 12 *s.* 8 *d.* 1 *f. fere*, allowing the Leſſor 6 *l. per Cent. per Annum.*

And after this manner was calculated the following Table, ſhewing the Amount of 1 *l.* Annuity to continue any number of Years under 21, and at any Rate of Intereſt from 5 *l.* to 10 *l. per Cent. per Annum.*

The Conſtruction of the following Table.

BUt tho' the following Table may be conſtructed moſt exactly by the preceding Rule; yet may it be more eaſily calculated by the help of the preceding Table 1. and near enough for ordinary Practice, after this manner, *viz.* Add the Tabular Number for the firſt Year in Table 1. to

to the Tabular Number for the firſt Year in Table 2. ſo ſhall their Sum be the Tabular Number for the ſecond Year in Table 2. Again, to this laſt Tabular Number add the Tabular Number for the ſecond Year in Table 1. ſo ſhall their Sum be the Tabular Number for the third Year in Table 2. *&c.*

Example. Let us pitch upon the fourth Column, Table 2. and calculate the Tabular Numbers for *7 l. per Cent. per Annum.* Firſt, I add the firſt Number in Table 1. for *7 l. per Cent.* which is 1,07000, to the firſt Number in Column 4. Table 2. *viz.* 1,0000, and their Sum is 2,07000, which I place after 1,0000 for the ſecond Number in Column 4. Table 2. Again. to this Number laſt found I add the Intereſt of *1 l.* for 2 Years, at *7 per Cent.* and their Sum is 3,21490, which I place in the fourth Column of Table 2. for the third Number, *&c.*

Table 2. *Shewing what* 1 l. *Annuity, to continue any number of Years not exceeding* 20, *will amount to, Compound Interest being allowed at* 5, 6, *and* 7 per Cent. per Annum.

Years.	5	6	7
1	1,00000	1,00000	1,00000
2	2,05000	2,06000	2,07000
3	3,15250	3,18360	3,21490
4	4,31012	4,37461	4,43994
5	5,52563	5,63709	5,75073
6	6,80191	6,97531	7,15329
7	8,14200	8,39383	8,65402
8	9,64910	9,89746	10,25980
9	11,02656	11,49131	11,97798
10	12,57789	13,18079	13,81644
11	14,20678	14,97164	15,78359
12	15,91712	16,86994	17,88845
13	17,71298	18,88213	20,14064
14	19,59863	21,01506	22,55048
15	21,57856	23,27596	25,12902
16	23,65749	25,67252	27,88805
17	25,84036	28,21287	30,84021
18	28,13238	30,90567	33,99903
19	30,53900	33,75999	37,37896
20	33,06595	36,78559	40,99549

A Continuation of the former Table, ſhewing what 1 l. *Annuity, to continue any number of Years not exceeding* 20, *will amount to, at* 8, 9, *and* 10 per Cent. per Annum.

Years.	8,	9	10
1	1,00000	1,00000	1,00000
2	2,08000	2,09000	2,10000
3	3,24640	3,27810	3,31000
4	4,50611	4,57312	4,64100
5	5,86660	5,98471	6,10510
6	7,33592	7,52333	7,71561
7	8,92280	9,20043	9,48717
8	10,63862	11,02847	11,43588
9	12,48755	13,02103	13,57947
10	14,68456	15,19292	15,93742
11	16,64548	17,56029	18,53116
12	18,97712	20,14071	21,38428
13	21,49529	22,95338	24,52271
14	24,21492	26,01918	27,97498
15	27,15211	29,36091	31,77248
16	30,32428	33,00339	35,94972
17	33,75022	36,97371	40,54470
18	37,45024	41,30133	45,59917
19	41,44626	46,01847	51,15909
20	45,76196	51,16011	57,27499

The Uſe of the preceding Table.

WHen there is an Annuity to continue a certain Number of Years, and it is required to find the utmoſt Improvement of it, allowing the Leſſor a certain Rate of Compound Intereſt; look the Years of Continuance in the ſide Column, and the Intereſt in the top Column, and in the Common Angle of Meeting is the Amount of 1 *l.* Annuity, to continue the Time and at the Rate of Intereſt propoſed; by which multiplying the Annuity propounded, the Product ſhall be the Amount or Encreaſe of the ſaid Annuity.

Example.

What is the Amount of 227 *l.* 5 *s.* payable yearly, being forborn the ſpace of 15 Years, Compound Intereſt being reckoned at 9 *l. per Cent. per Annum*?

Looking for 15 Years in the ſide Column, under 9 *per Cent.* I find 29,36091, which is the Amount of 1 *l.* Annuity for the ſaid time; by which multiplying 227,25 *l.* the Product is 6672,2667975 *l.* and ſo much is the Amount of 227 *l.* 5 *s.* Annuity, to continue 15 Years: For,

	l.		*l.*
As 1	: 29,36091	:: 227,25	: 6672,2667

6. When

6. When it is required to find how much preſent Money will purchaſe an Annuity to continue any number of Years, allowing the Purchaſer a certain Rate of Compound Intereſt; find a Rank of continued Proportionals, one more in number than the Term of Years propounded, which ſhall decreaſe from the given Annuity in ſuch proportion as 100 *l.* decreaſes from 100 and the Rate of Intereſt added together: So ſhall the Sum of all the ſaid Proportionals (excepting the firſt, *viz.* the given Annuity) be the preſent Worth of the Annuity propoſed.

Example.

There is an Annuity of 20 *l. per Ann.* to continue 5 Years; how much preſent Money is it worth, Diſcount being allowed at 6 *l. per Cent. per Ann.* Compound Intereſt? Find the preſent Worth of 20 *l.* for 1, 2, 3, 4, and 5 Years, and add thoſe preſent Worths together, as you ſee by the following Work.

		l.	*l.*	*Years.*
		20	: 18,8679	— 1
	l.	18,8679	: 17,7999	— 2
As 106	: 100 ::	17,7999	: 16,79235	- 3
		16,79235	: 15,84184	- 4
		15,84184	: 14,94513	- 5
			84,24712	

So that by the preceding Work I find the present Worth of 20 *l. per Ann.* (to continue 5 Years, Rebate being made at 6 *per Cent.*) to be 84 *l.* 4 *s.* 11 *d.* 1 *f. fere.*

Let another Example be this: There is an Annuity or Yearly Rent of 1 *l.* to continue 6 Years; What present Money is it worth, Rebate being allowed at 5 *l. per Cent. per Annum?*

First, as by the aforegoing Example, find 7 Geometrical Proportionals decreasing from 1 *l.* (the given Annuity) in such proportion as 100 decreases from 105 *l.* so will the Sum of the 6 least be the present Worth (of 1 *l.* Annuity) desired. See the Work.

		l.	*l.*	*Years.*
l.	*l.*	1	: ,952381	— 1
105	100	,952381	: ,907029	— 2
		,907029	: ,863837	— 3
		,863837	: ,822702	— 4
		,822702	: ,783526	— 5
		,783526	: ,746215	— 6
			5,075690	

By which I find the present Worth of 1 *l.* Annuity, to continue 6 Years, at 5 *l. per Cent. per Ann.* to be 5,075690, which is 5 *l.* 1 *s.* 6 *d.*

And

will purchaſe, to continue any number of Years, and at any Rate of Intereſt propoſed, by looking the preſent Worth of 1 *l.* Annuity, to continue the Time and at the Rate of Intereſt propounded.

For it is evident, that if ſuch a Sum be the preſent Worth of 1 *l. Annuity*, it will purchaſe an Annuity of 1 *l.* to continue for the Time and at the Rate of Intereſt propoſed. Therefore ſay, If that Sum purchaſe 1 *l.* Annuity, what will any other Sum purchaſe? As in the following Example.

What Annuity, to continue 10 Years, will 1000 *l.* purchaſe, allowing the Purchaſer 8 *l. per Cent. per Ann.* Compound Intereſt? The preſent Worth of 1 *l.* Annuity for the Time and at the Rate of Intereſt is 6,71008, by which dividing 1000, the Quotient is 149.029 *l.* and ſuch an Annuity will 1000 *l.* purchaſe. For,

	l.	*l.*	*l.*	*l.*
As 6,71008	: 1	: : 1000	: 149,029	

Queſtions for the Exerciſe of Compound Intereſt.

1. THere is an Annuity iſſuing out of certain Lands, to be let for 18 Years, for 650 *l.* ready Money; but the Leſſee deſireth rather to pay an Annual Rent: The Queſtion is, What Rent he muſt pay, Compound Intereſt being allowed at 8 *per Cent.*

Anſw. 69 *l.* 7 *s.* 1 *d.* 2 *f. fere.*

Firſt find the preſent Worth of 1 *l.* Annuity for the Time and at the Rate of Intereſt propos'd, which by Table 3 is 9,37188. Secondly, ſay,

	l.		*l.*		*l.*		*l.*
As	9,37188	:	1	: :	650	:	69,3564

2. There is a Leaſe of certain Lands to be let for 10 Years, worth 1200 *l.* in ready Money: Now ſuppoſe the Leſſee payeth but 200 *l.* in hand, what Annual Rent muſt he pay that may be equivalent to the Complement of the ſaid preſent Worth, Compound Intereſt being computed at 6 *l. per Cent. per Annum*?

Anſw. 135 *l.* 17 *s.* 2 *d.* 2 *f. fere.*

Firſt, Subſtract 200 *l.* from 1200 *l.* and the Remainder is 1000 *l.* Secondly, By the preceding

preceding Table 3. find what Annuity to continue 10 Years 1000 *l.* will purchaſe, and you ſhall find the Anſwer to be 135,861 *l.* and ſo much muſt the Annual Rent be.

3. There is a Leaſe of a Houſe to be let for 7 Years, which is worth 206 *l.* Fine, and 36 *l. per Annum*; but the Leſſee would pay only 10 *l. per Annum*, and enhance the Fine: The Queſtion is, What Fine the Leſſee muſt pay, Compound Intereſt being computed at 10 *l. per Cent. per Annum*?

Anſw. 332 *l.* 11 *s.* 6 *d.* 3 *f. fere.*

Firſt find the Difference of the Annual Rents, which is 26 *l.* Secondly, find the preſent Worth of an Annuity of 26 *l.* to continue 7 Years, at 10 *l. per Cent.* which by Table 3. is 126 *l.* 11 *s.* 6 *d.* 3 *f. fere*; which being added to 206 *l.* the former Fine, makes the Sum to be 332 *l.* 11 *s.* 6 *d.* 3 *f. fere*; and ſo much Fine ought the Tenant to pay to perform the Conditions required.

4. What Annuity, to continue 13 Years, will 1999 *l.* due 9 Years hence, purchaſe, Compound Intereſt being allowed on both ſides at 8 *l. per Cent per Annum*?

Anſw. 126 *l.* 10 *s.* 4 *d.* 3 *f. fere.*

Firſt ſeek the preſent Worth of 1999 *l.* due

due 9 Years hence, which will be found to be 1000 *l. fere.* Then by Table 3. find what Annuity, to continue 13 Years, 1000 *l.* will purchaſe, allowing Intereſt at 8 *per Cent.* and it will be 126 *l.* 10 *s.* 4 *d.* 3 *f. fere.*

5. There is a Leaſe of certain Lands to be let for 19 Years, for 100 *l.* Fine and 20 *l. per Annum*; but the Tenant is willing to pay 200 *l.* Fine, and to pay the leſs yearly Rent: The Queſtion is, What Annual Rent he ought to pay to anſwer the Conditions required, Compound Intereſt being allow'd at 7 *l. per Cent. per Ann.*

Anſw. 10 *l.* 0 *s.* 6 *d.*

Firſt ſeek the Difference of the Fines, which is 100 *l.* Secondly, ſeek what Annuity, to continue 19 Years, 100 *l.* will purchaſe, which by Table 3. will be found to be 9 *l.* 13 *s.* 6 *d.* which ſubſtracted from 20 *l.* (the old Rent) leaves 10 *l.* 6 *s.* 6 *d.* for the Rent the Leſſee ought to pay, that his Fine may be encreaſed by 100 *l.*

6. If the Leaſe of a Houſe be worth 40 *l. per Ann.* of which Leaſe there is 6 Years yet to come, what ready Money is to be paid for a Leaſe for 15 Years in reverſion, to commence at the Expiration of the old Leaſe, Compound Intereſt being computed at 10 *l. per Cent. per Ann. Anſw.* 171 *l.* 14 *s.* 9 *d. fere*

Firſt,

Firſt, find the preſent Worth of 40 *l.* Annuity to continue 15 Years, which by Table 3. is 304 *l.* 2 *s.* 10 *d.* 2 *f. fere.* Then ſeek the preſent Worth of 304 *l.* 2 *s.* 10 *d.* 2 *f.* due 6 Years hence, which by Table 1. will be found to be 171 *l.* 14 *s.* 9 *d.* And ſo much preſent Money ought the Leſſee to pay, to perform the aforeſaid Conditions.

Or thus:

Add the Years in Reverſion to the Years to come in the old Leaſe, and the Sum is 21 Years: Then will the Work be as followeth.

	l.
The preſent Worth of 1 *l.* Annuity, to continue 21 Years, is	8,64869
The preſent Worth of 1 *l.* Annuity, to continue 6 Years, is	4,35526
The Difference of which is the preſent Worth of 1 *l.* Annuity for 15 Years, in Reverſion after 6 Years	4,29343
	40
Which multiplied by 40, the propoſed Rent, gives the Anſwer as before, *viz.*	171,73720

CHAP.

CHAP. XIV.

Practical Queſtions of Barter, Loſs, Gain, Exchange of Coins, &c.

Qu. 1. A Man hath 114 pound weight of Tobacco, at 6 *d per* pound; how many pound of Cotton Wooll, at 14 *d. per* pound, muſt he have in exchange for the ſaid 114 pound of Tobacco?

Anſw. 48 $\frac{6}{7}$ pound,

Firſt ſay by the Rule of Proportion,

po. Toba. d. po. Tobac. l.
If 1 : 6 : : 114 : 2 $\frac{17}{20}$

s po. Cot. Wo. s. po. Cot. Woll.
As 1 $\frac{2}{12}$: 1 : : 57 : 48 $\frac{6}{7}$

2. How many Groſs of *Mancheſter* Tape, at 24 *s. per* Groſs, are equivalent to 73 *Spaniſh* Piſtolets, at 17 *s.* 6 *d.* the piece?

Anſw. 53,23 *Groſs.*

Piſt. s. Piſt. l. s. d.
1. *If* 1 : 17,5 : : 73 : 63 17 6

s. Gro. Tape. s. Gro. Tape.
2. *If* 24 : 1 : : 1277,5 : 53,23

3. A

3. A Draper hath bought a parcel of Cloth, containing in all 360 Yards, at 7 *s.* *per* Yard: At what Price muſt he ſell one Yard of that again, to gain after the Rate of 15 *l.* for every 100 *l.* laid out?

Anſw. $8\frac{1}{20}$ *s.*

Say by the Rule of Proportion,

If 100 encreaſe to 115 *l.* what will 7 *s.* encreaſe to?

Anſw. $8\frac{1}{20}$.

l.	*l.*	*l.*	*l.*	*s.*
100 :	115 : :	$\frac{7}{20}$:	$\frac{161}{400}$:	*or* $8\frac{1}{20}$

4. If a parcel of *Iriſh* Yarn coſt me after the Rate of 14 *d.* *per* Pound, and I ſell the ſame for $14\frac{1}{2}$ *d.* how much do I get by every 20 *l.* I lay out?

Anſw. $\frac{10}{14}$ *l.* For,

	d.	*d.*	*l.*	*l.*
If	14 :	$14\frac{1}{2}$: :	20 :	$20\frac{10}{14}$

5. A *Mancheſter* Chapman buyeth Yarn at 9 *s.* the Head, which proving unfit for his Uſe, he is willing to ſell it again at ſuch a Rate that he may loſe 10 *l.* for every 100 *l.* laid out: What muſt be the Price of one Head?

Anſw. $8\frac{1}{10}$ *s.*

	l.	*l.*	*s.*	*s.*
As	100 :	10 : :	9 :	$\frac{2}{101}$

Which

Which ſubſtracted from 9 *s.* there remains $8\frac{1}{10}$ *s.* which is the Price of one Head at the aforeſaid Abatement.

6. If 100 Ells of *Amſterdam* make 60 Yards of *London*, how many Ells of *Amſterdam* are equal to 220 Yards of *London*?

Anſw. $366\frac{4}{6}$ Ells.

Yards.	*Ells.*	*Yards.*	*Ells.*
60	100 ::	220	$366\frac{4}{6}$

7. When a Florin of *Frankfort* is worth 5 *s. Sterling*, how many ſuch Pieces ought to be received for 150 *l. Sterling*?

Anſw. 600 Florins.

150 *l.* being reduc'd to Shillings, the Work will ſtand thus.

s.	*Flor.*	*s.*	*Flor.*
5	1 ::	3000	600

8. When there is a Compariſon made between divers ſorts of Coins, Meaſures, *&c.* as when the firſt is compared with a ſecond, a ſecond with a third, and that with a fourth; in theſe kind of Queſtions there are only two Varieties, *viz.* 1. How many Pieces of the firſt Coin, or Denominations of Weights, *&c.* are equal to a given Number of Pieces of Coin, *&c.* of the laſt ſort? Or, 2. How many of the laſt Pieces are equal to a given Number of the firſt?

In

In both which Caſes, take theſe General Rules.

Firſt, Place every other Number according to their ſucceſſion in the Queſtion, in two different Columns, *viz.* the firſt, third, fifth, ſeventh, *&c.* (if there be ſo many) in the firſt Column; likewiſe the ſecond, fourth, ſixth, eighth, *&c.* in the ſecond Column. But,

Secondly, Always obſerve, That two Numbers of one Denomination be not found in one and the ſame Column; ſo that the laſt Number muſt always ſtand in the contrary Column to the Number of the ſame Denomination.

Thirdly, Multiply all the Terms which ſtand in the greater Column continually; ſo ſhall their Product be your Dividend: Likewiſe multiply all the Terms found in the leſs Column continually; ſo ſhall their Product be your Diviſor; by which dividing the firſt Number found, the Quotient ſhall be the Number deſired: As in the following

Example.

If 30 Crowns *Genoa* be equal to 37 Ducats *Rome*, 32 Ducats *Rome* equal to 35 Ducats *Millain*, and 48 Ducats *Millain* equal to 40 Florins *Frankfort*; how many Crowns *Genoa* are equal to 83 Florins *Frankfort*?

Anſw. $73\frac{4}{5}\frac{3}{1}\frac{2}{8}\frac{4}{0}$ Crowns.

According

According to the premiſed Directions, I place the firſt, third, and fifth Terms in the firſt Column; likewiſe the ſecond, fourth, and ſixth in the ſecond Column; and becauſe 83 Florins, which is the laſt Term, is of the ſame Denomination with 40 Florins found in the ſecond Column, I therefore place it in the firſt Column.

Genoa—30=37 Ducats *Rome.*
Rome—32=35 Ducats *Millain.*
Millain 48=40 Florins *Frankfort.*
Florins 83=?

Then proceeding to ſolve the Queſtion as before directed, I multiply the Terms in the firſt Column continually, and their Product is 3824640 for my Dividend: Likewiſe I multiply the Terms found in the ſecond and leaſt Column continually, and their Product is 51800. Laſtly, I divide 3824640 by 51800, and the Quotient proceeding is $73\frac{4240}{51800}$; and ſo many Crowns *Genoa* are equal in Value to 83 Florins *Frankfort.*

CHAP.

CHAP. XV.

Rules of Practice.

1. WHen a Queſtion belonging to the Rule of Three Direct hath 1 or Unity in the firſt place thereof (as it many times happens) it may more eaſily be ſolved by one of the following Rules, commonly call'd Rules of Practice.

2. The Rules of Practice are either when the Price of the given Integer conſiſts of Shillings under 20, of Pence under 12, or of Farthings under 4; or elſe when it is compos'd of two or more of the aforeſaid Denominations.

3. When the Price of the given Integer is 2 *s.* or $\frac{1}{10}$ of a Pound *Sterling*, cut off one Place or Figure towards the Right Hand of the given Number of Integers, ſo ſhall the Figures towards the Left Hand give Pounds, and the Figure on the Right Hand being doubled give Shillings.

Example. If 1 Pound weight (of any thing) coſt 2 *s.* what is the Value of 224 Pound? *Anſw.* 22 *l.* 8 *s.* For cutting off one Place on the Right Hand of 224, there remains on the Left Hand 22, which are to be eſteem'd Pounds, and on the Right Hand

Hand $\frac{4}{10}$ of a Pound: Therefore doubling 4, there will arise 8 *s.* which added to the former Sum, makes it to be 22 *l.* 8 *s.* For,

	l.	*s.*		*l.*	*l.*	*s.*
As	1	: 2	: :	224	: 22	8

4. When the Price of the given Integer consisteth of any even Number of Shillings more than two, first multiply the given Number of Integers by half the Number of Shillings proposed: Secondly, cut off one Place towards the Right Hand; so shall the Figures on the Left Hand be Pounds, and the Figure to the Right Hand being doubled shall be shillings.

Example. What shall 721 Yards of *Holland* Cloth cost, when 1 Yard is sold for 6 *s.* *Answ.* 216 *l.* 2 *s.* For 721 being multiplied by 3 (half the number of Shillings given for one Yard) the Product is 2163, from which cutting off one Figure to the Right Hand, there is 216 *l.* and $\frac{3}{10}$ of a Pound, equal to 6 *s.* so that the whole Value of 721 Yards is 216 *l.* 6 *s.*

	Yard.	*s.*		*Yards.*	*l.*	*s.*
As	1	: 6	: :	721	: 216	6

5. When the Price of the given Integer is 1 *s.* or $\frac{1}{20}$ of a Pound *Sterling*, cut off one

one Place towards the Right Hand of the given Integers, as before; ſo ſhall the Figures to the Right Hand give Shillings, and thoſe on the Left Hand, being halved, or divided by 2, give Pounds.

Example. If 1 Pound weight of Tobacco coſt 1 *s.* what ſhall 245 Pound coſt at that Rate? *Anſw.* 12 *l.* 5 *s.*

Firſt, I cut off the Figure 5 to the Right Hand, which I ſet apart as Shillings. Secondly, I take the half of 24 (the Figures on the Left Hand) which is 12 *l.* which being added to 5 *s.* makes the Sum to be 12 *l.* 5 *s.*

Or otherwiſe thus:

Multiply the given Number of Integers propos'd (which in our Example is 245) by this Decimal ,05, and the Product will give the Value of the ſaid Integers in Pounds and Decimal Parts of a Pound. So 245 being multiplied by ,05, the Product is 12,25 *l.* equal to 12 *l.* 5 *s.* as before.

245	
,05	
12	25

6. When the Price of the given Integer conſiſteth of an uneven Number of Shillings. *viz.* of 2 *s.* or $\frac{1}{10}$ of a Pound taken a certain Number of times, and beſides of 1 *s.* or $\frac{1}{20}$ of a Pound; firſt work for the even Shillings by the Fourth of this Chapter, and for the odd Shillings by the Fifth

of

of this Chapter: Secondly, add the two Results together, so shall their Sum be the Value of the Integers propos'd.

Example. If one Pound weight cost 7 *s.* what will 347 Pound cost? *Answ.* 121 *l.* 9 *s.*

l.
1 : 7 : : 347
3
104 : 2
17 : 7
121 : 9

First, I seek what 347 Pound will cost at 6 *s.* the Pound, by the Fourth of this Chapter; and the Answer I find to be 104 *l.* 2 *s.* Secondly, I seek what 347 Pound weight will come to at 1 *s.* the Pound, by the Fifth of this Chapter; and the Answer I find to be 17 *l.* 7 *s.* Lastly, I add the two Results together, and their Sum is 121 *l.* 9 *s.* And so much will 147 Pound cost, at 7 *s.* the Pound.

Or otherwise thus:

Multiply the Integers proposed by the Number of Shillings given for one Integer, and that Product by this Decimal ,05; so shall the last Product found exhibit the Value of the given Integers in Pounds and Decimal Parts of a Pound. Thus if 347 be multiplied by 7 *s.* the Product is 2429, which multiplied into ,05, the last Product is 121,45, equal to 121 *l.* 9 *s.* as before.

347
7
2429
,05
121,45

7. When

7. When the Price of the given Integer is any Number of Pence under a Shilling, it is to be conſidered either as an Aliquot part of a Shilling, or elſe compos'd of two or more Aliquot parts.

8. An Aliquot part of a Shilling is any Number of Pence which will preciſely meaſure 12, without any Remainder. So if 12 were divided by 3, the Quotient would be 4; ſo that 3 *d.* is the $\frac{1}{4}$ of a Shilling: And by the ſame Rule is 4 *d.* found to be the $\frac{1}{3}$, 6 *d.* the $\frac{1}{2}$, and 2 *d.* the $\frac{1}{6}$ of a Shilling; and ſo of the reſt.

9. When the Price of one Integer is an Aliquot part of a Shilling, divide the Integers propos'd by the Denominator of the Aliquot part; ſo ſhall the Quotient be the Value of the ſaid Integers reduced into Shillings.

Example. At 6 *d.* the Ounce, what will 426 Ounces coſt? *Anſw.* 10 *l.* 13 *s.*

Firſt, becauſe 6 *d.* is the $\frac{1}{2}$ of 1 *s.* I divide 426 by 2, and the Quotient is 213 *s.* which being reduc'd into Pounds by the Fifth of this Chapter, is 10 *l.* 13 *s.* And ſo much is the value of 426 Ounces at 6 *d.* the Ounce. See the following Work.

oz.	*d.*	*oz.*
1	: 6 :	426
	20)	213 *s.*
Anſwer		10 *l.* 13 *s.*

More Examples are theſe.

l.	*d.*	*l.*
1	4	641

20) 21|3 *s.* 8 *d.*

Anſwer 10 *l.* 13 *s.* 8 *d.*

quart.	*d.*	*quarts.*
1	2	726

20) 12|1 *s.*

Anſwer 6 *l.* 1 *s.*

10. But when the Price of one Integer conſiſteth of any Number of Pence under a Shilling, yet will not exactly divide 12, ſuch are ſaid to be compos'd of two or more Aliquot Parts, ſo 7 *d.* is compos'd of two Aliquot parts, that is, of $\frac{1}{4}$, *viz.* 3 *d.* and of $\frac{1}{3}$, *viz.* 4 *d.* and ſo 9 *d.* is compos'd of $\frac{1}{2}$, *viz.* 6 *d.* and of $\frac{1}{4}$, *viz.* 3 *d.* And ſo of the reſt.

11. Having found of what Aliquot parts the propos'd Number of Pence do conſiſt, take their Denominators, as in the Tenth of this Chapter; by which ſeverally divide the Number of Integers whoſe Value is required, and add thoſe Reſults together; ſo ſhall their Sum be the Number deſired.

Example. At 7 *d.* the Yard, what comes 164 Yards to? *Anſw.* 4 *l.* 15 *s.* 8 *d.*

I con-

I consider that 7 *d.* is the $\frac{1}{4}$ and $\frac{1}{3}$ of 12 *d.* therefore first I divide 164 by 4, and the Quotient is 41 *s*; secondly, I divide 164 by 3, and the Quotient is 54 *s.* 8 *d.* Lastly, I add the Quotients together, and they make 95 *s.* 8 *d.* which being reduc'd to Pounds by the Fifth of this Chapter, makes the Sum to be 4 *l.* 15 *s.* 8 *d.* And so much is the Worth of 164 Yards, at 7 *d. per* Yard. See the Work.

Yard.	*d.*	*Yards.*
1	7	164

	s.	*d.*
The Divisor 4	41	0
The Divisor 3	54	8
	95	8
Answer	4 *l.* 15 *s.* 8 *d.*	

Another Example is this which followeth.

Ell.	*d.*	*Ells.*
1	11	568

	s.	*d.*
The Divisor 2	284	0
The Divisor 4	142	0
The Divisor 6	094	8
	520	8
Answer	26 *l.* 0 *s.* 8 *d.*	

12. When the Price of the given Integers is of Farthings leſs than a Peny, take their Aliquot part of 1 *d.* ½, by which divide the propoſed Integers, and that Quotient ariſing by 8; ſo ſhall the laſt Quotient be the Value of thoſe Integers reduced to Shillings.

Example. If 1 Pound weight coſt 3 Farthings, what will 692 weight coſt? *Anſw.* 2 *l.* 3 *s.* 3 *d.*

Firſt (becauſe 3 Farthings is the ½ of 1 *d.* ½) I divide 692 by 2, and the Quotient is 346, which I divide by 8, and the Quotient is 43 *s.* 3 *d.* which being reduc'd to Pounds by the Fifth of this Chapter, is 2 *l.* 3 *s.* 3 *d.* And ſo much is the Worth of 692 Pound, at 3 Farthings *per* Pound, as by the Work appears.

Pound.	*Farthings.*	*Pounds.*
1	3	692
	8)	*s.* *d.*
	2) 692 (346 (43 : 3	

The Anſwer 2 *l.* 3 *s.* 3 *d.*

And ſo may the Worth of the ſaid Integers be found for any Farthings aſſigned for the Price, by taking the correſponding Aliquot part of Three half-pence.

13. Whe

13. When the Price of one Integer conſiſteth of two or more of the aforeſaid Denominations, work for the ſeveral Denominations propoſed by the reſpective Rules in this Chapter, and add the Reſults together; ſo ſhall their Sum be the Anſwer to the Queſtion.

Example. At 3 *s.* 6 *d.* 2 *f.* the Hundred, what comes 348 Hundred to? *Anſw.* 61 *l.* 12 *s.* 6 *d.*

Firſt, 348 Hundred, at 3 *s.* the Hundred, comes to 52 *l.* 4 *s.* by the Fifth of this Chapter.

Secondly, 348 Hundred, at 6 *d.* the Hundred, is 174 *s.* which reduc'd by the Fifth of this Chapter, is 8 *l.* 14 *s.*

Thirdly, 348 Hundred, at $\frac{1}{2}$ *d.* the Hundred, is 14 *s.* 6 *d.* by the Twelfth of this Chapter.

And laſtly, The Sum of all theſe Reſults is 61 *l.* 12 *s.* 6 *d.* See the Work.

C.		C.	*l.*	*s.*	*d.*
1	3 *s*	348	52	04	00
1	6 *d*	348	08	14	00
1	2 *f*	348	00	14	06
	The Anſwer		61	12	06

CHAP. XVI.

Questions for the Exercise of Arithmetick.

1. THere is an Army compos'd of a certain Number of Horse and Foot: The Horse are $\frac{1}{4}$ of the whole Army, and the Foot $\frac{2}{3}$, and besides there is 3520 Dragoons; the Question is, Of how many doth the whole Army consist? *Ans.* 42240. First add $\frac{1}{4}$ and $\frac{2}{3}$ together, and they make $\frac{11}{12}$: Then substract $\frac{11}{12}$ from Unity, and there remains $\frac{1}{12}$ for the Dragoons. Lastly say, *As* $\frac{1}{12}$: 3520 :: 1 : 42240.

2. A Gardiner being asked how many Trees there was in his Orchard, answered, That the one half of the Trees were Apple-trees, the quarter Pear-trees, and the seventh part Plumb-trees, and that there were 12 Cherry-trees besides; How many Trees were there in all? *Answ.* 112. $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{7}$ being added together make $\frac{50}{56}$, which substracted from Unity, there remains $\frac{6}{56}$ for the Cherry-trees: Therefore say,

As 6 : 12 :: 56 : 112 *in all.*

3. If *A.* can do a piece of Work in 15 Days, and *B.* in 20 Days, in what time can *A.* and

A. and *B.* working together do it? *Anſ.* In $8\frac{4}{7}$ Days. Say,

Days. Work. Days.
If 15 : *do* 1 : : *what* 20?

Anſwer. $1\frac{1}{3}$: And ſo much will *A.* have done in 20 Days; which added to 1, the Work of *B.* in the ſaid time, the Sum is $2\frac{1}{3}$ Works; and ſo many Works will they both do, working together. And laſtly, to find in what time they will do one Work, ſay,

Work. Days. Work.
If $2\frac{1}{3}$ or $\frac{7}{3}$ *require* 20 *what will* 1 *require?*

Anſw. $8\frac{4}{7}$ Days.

4. Two Horſemen, *A.* and *B.* ſet out at the ſame time from two oppoſite Cities, being diſtant 376 Miles: *A.* rides 36 Miles a Day, and *B.* 47 Miles; the Queſtion is, In how many Days they will meet? *Anſw.* In $4\frac{4}{8}\frac{4}{7}$ Days. 1. Add 36, the Miles that *A.* rides each Day, to 47, the Miles that *B.* rid, and the Sum is 83. 2. Say,

Miles. Day. Miles. Days.
As——83——1——376——$4\frac{4}{8}\frac{4}{7}$

5. There is an Iſland which is 45 Miles in Circumference: Now from the ſame Place two Footmen, *A.* and *B.* ſet forth, running the ſame way: *A.* runs 6 Miles

every Hour; the Queſtion is, How many Miles an Hour *B.* muſt run to meet *A.* again in 16 Hours? *Anſw.* $8\frac{1}{16}$ Hours.

Hours. Miles. Hour.
If 16 : 45 : : *what* 1?

Anſwer. $2\frac{1}{16}$ Miles: And ſo many Miles an Hour muſt *B.* run more than *A.* Therefore adding 6 Miles to $2\frac{1}{16}$, the Sum is $8\frac{1}{16}$, the Miles that *B.* muſt run each Hour.

6. Three Cheeſemongers, *A. B.* and *C.* buy a certain number of *Gloceſterſhire* Cheeſes, which coſt them 40 *l.* Now it is mutually agreed amongſt them, that *A* ſhall pay $\frac{1}{2}$, *B.* $\frac{1}{3}$, and *C.* $\frac{1}{4}$ of the ſaid Sum: What part of the ſaid 40 *l.* muſt every Man pay?

	l.	*l.*	*s.*	*d.*
$\frac{1}{2}$ of 40 is	——	20	0	0
$\frac{1}{3}$ of 40 is	——	13	6	8
$\frac{1}{4}$ of 40 is	——	10	0	0
		43	6	8

If the Payment ſhould be thus made, the Buyers would loſe 3 *l.* 6 *s.* 8 *d.* Therefore to perform this Queſtion, or any of the ſame Nature, reduce all the Fractions into one Denomination, by the Firſt of the Second Chapter, and add them together for the

the first Number in the Rule of Proportion. So,

$\left.\begin{matrix}\frac{1}{2}\\ \frac{1}{3}\\ \frac{1}{4}\end{matrix}\right\}$ reduced is $\left\{\begin{matrix}\frac{12}{24}\\ \frac{8}{24}\\ \frac{6}{24}\end{matrix}\right.$

Their Sum — $\frac{26}{24}$

Therefore I find the respective Part of each by the following Proportion.

				l.	
As	26	40	12	$18\frac{12}{26}$	*A's Share.*
	26	40	8	$12\frac{8}{26}$	*B's Share.*
	26	40	6	$9\frac{6}{26}$	*C's Share.*
				40	*The Sum compleat*

7. There is 100 *l.* to be distributed amongst three Persons, *A. B.* and *C.* as followeth. *A.* is to have a Share unknown; *B.* is to have twice as much as *A.* and 10 *l.* over; and *C.* is to have three times as much as *A.* wanting 6 *l.* What is the Share of each? Suppose *A.* to have 1 *l.* or Share, then are the rest as followeth.

	l.	*l.*
A	1	
C	2 more	10
C	3 wanting	6
	6	

Therefore the whole is 6 *l.* more 10 *l.* wanting 6 *l.* which being ſubſtracted from 10, there remains 4 *l.* So that the perfect Sum is 6 *l.* more 4 *l.* which ſhould be equal to 100 *l.* but becauſe it is not, ſubſtract 4 from 100, and there remains 96; which being divided by 6, the Quotient is 16 *l.* for the Share of *A.* then are the reſt as followeth.

	l.
The Share of A. ——	16
The Share of B. ——	42
The Share of C. ——	42
The Compleat Sum --	100

8. A Man dying bequeaths the Sum of 1269 *l.* as followeth. To his Eldeſt Son a Share unknown; to his Wife one half of the Eldeſt Sons Legacy, and 6 *l.* over; to the Younger Son one third of the Eldeſt Sons Legacy, wanting 25 *l*; and to the Poor of the Pariſh twice the Part of the Eldeſt Son, and three times the Share of the Wife, wanting 10 *l.* What is the Share of each? Suppoſe that the eldeſt Son had 1 *l.* or Share, then are the reſt as followeth.

Eldeſt

	l.		*l.*		*l.*
Eldeſt Son	1				
The Wife —	$\frac{1}{2}$ *more*		6		
Younger Son	$\frac{1}{3}$ ——			*wanting*	25
To the Poor	$3\frac{1}{2}$ *more*		18	*wanting*	10
The Sum —	$5\frac{1}{3}$ *more*		24	*wanting*	35

This $5\frac{1}{3}$ more 24 wanting 35, ſhould be equal to 1269; but becauſe it is not, take 24 from 35, and the Remainder is 11: Therefore the entire Sum is $5\frac{1}{3}$ wanting 11. Now adding 11 to 1269, the Sum is 1280 for a Dividend, which being divided by $5\frac{1}{3}$, the Quotient is 240 for the Eldeſt Sons Share, and the reſt will be as followeth.

Eldeſt Son——	240
Wife ——	126
Younger Son —	55
Pariſh Poor--—	848
Compleat Sum	1269

9. *A.* and *B.* enter into Fellowſhip: *A* puts in 100 *l.* for 4 Months, and *B* 120 *l.* for 6 Months; by which they gain 84 *l.* Now it is mutually agreed that *A* ſhall have 6 *l. per Cent.* for the Uſe of his Money, and *B* 8 *l. per Cent.* for the Uſe of his Money:

What

What part of the ſaid 84 *l.* muſt each have? *Anſw. A* muſt have 24 *l.* 14 *s.* 1 *d.* 1 *f.* and *B* 59 *l.* 5 *s.* 10 *d.* 3 *f. fere.*

Firſt, Multiply each Man's Stock, his Time, and his Rate of Intereſt continually; ſo will the Products reſulting be for *A* 2400, and for *B* 5760.

Secondly, Add theſe Products together for the firſt Term, 84 *l.* the ſecond, and each particular Number the third; then will the Analogy be,

	l.	*l.*
As 8160 : 84 ::	2400 :	24,7056 *A's part.*
	5760 :	59,2934 *B's part.*

10. Three Merchants, *A*, *B*, and *C*, enter into Fellowſhip: *A* put into the Common Stock 150 *l.* for 2 Months; *B* put in a certain Sum unknown, which continued in Company 4 Months; and *C* put in 400 *l.* for a certain Time unknown: Now they divide the Gain equally; the Queſtion is, How much did *B* put into the Common Stock, and how long the Stock of *C* continued in Company? *Anſw. B* put in 75 *l.* and the Stock of *C* continued 3 Weeks in Company.

Firſt, Multiply the Stock of *A* by its time, and the Product will be 300. Secondly,

ly, Divide 300 by 4, (the number of Months that *B*'s Stock continued in Company) and the Quotient is 75; and ſo much Stock did *B* put in at the firſt. Laſtly, Divide 300 by 400 (the Stock of *C*) and the Quotient is $\frac{3}{4}$ of a Month, or 3 Weeks; and ſo long did the Stock of *C* continue in Company.

11. A Man gives 300 *l.* to be diſtributed amongſt 3 Perſons, *A*, *B*, and *C*, in ſuch ſort that for every 2 *l.* *A* had, *B* was to have 3; and for every 4 *l.* that *B* had, *C* was to have 5. What part of the ſaid 300 *l.* had each Man?

Firſt, Find what Proportion *C*'s Money hath to that of *A*, by the Rule of Three, thus;

	l.	*l.*	*l.*	*l.*
As	4	: 5 : :	3	: $3\frac{3}{4}$

Secondly, Add 2 *l.* 3 *l.* and $3\frac{3}{4}$ *l.* and their Sum is $8\frac{3}{4}$ *l.* which is the firſt Term in the Rule of Three, 300 *l.* the ſecond, and every particular Number the third. Therefore ſay,

	l.	*l.*		*l.*	*l.*
As	$8\frac{3}{4}$	: 300 : :	2	:	$68\frac{2}{7}\frac{0}{5}$
			3	:	$102\frac{3}{7}\frac{0}{5}$
			$3\frac{3}{4}$	:	$128\frac{2}{7}\frac{0}{5}$
			The Sum Compleat ——		300

12. A

12. A Merchant selleth a certain Number of Oranges and Lemmons for 168 *l.* The Oranges were valued at 1 *s. per doz.* and the Lemmons at 2 *s. per doz.* Now suppose the number of Lemmons to be five times the number of Oranges, how many dozen of Oranges and Lemmons was there in all?

First, Suppose there was one dozen of Oranges, then were there five dozen of Lemmons.

	s.
Secondly, One dozen of Oranges at 1 *s. per* dozen, is	1
Five dozen of Lemmons, at 2 *s. per* dozen, is	10
Their Sum	11

Now this 11 *s.* should be equal to 168 *l.* or 3360 *s.* Therefore say,

	s.	*doz.*	*s.*	*doz.*
If	11	: 1	: : 3360	: $305\frac{5}{11}$
		: 8	: : 3360	: $1527\frac{3}{11}$

That is, there were $305\frac{5}{11}$ dozen of Oranges, and $1527\frac{3}{11}$ dozen of Lemmons; which added together make $1832\frac{8}{11}$, and so many dozen were there in all. Now to know whether the Work be right or not, find the Value of $305\frac{5}{11}$ dozen of Oranges at 1 *s. per* dozen, which by the Fifth Rule of the

last

last Chapter will be 15 *l.* $5\frac{5}{11}$ *s.* likewise the Value of $1527\frac{3}{11}$ dozen of Lemmons, at 2 *s.* *per* dozen, will be found to be 152 *l.* $14\frac{6}{11}$ *s.* by the Fourth of the last Chapter; which two Sums added together, make 168 *l.* the Sum given for the said Parcel of Oranges and Lemmons.

13. A Man hath 3 Sons, the youngest of which is 16 years old; and the Age of the youngest is $\frac{2}{3}$ of $\frac{1}{2}$ of the second Sons Age; likewise $6\frac{1}{2}$ the second Sons Age is equal to 4 times the eldest Sons Age; and lastly, the Age of the eldest Son is equal to $\frac{5}{8}$ of the Fathers Age: What is the Age of the Father? *Answ.* $124\frac{4}{5}$ years.

Find the intermediate Ages as followeth.

Years. *Years.*

First, $\frac{2}{6}$: 16 : : 1 : 48 *second Sons age.*

Secondly, Multiply 48 by $6\frac{1}{2}$, and the Product is 312.

Years. *Years.*

4 : 312 : : 1 : 78 *the eldest Sons age.*

Thirdly, $\frac{5}{8}$: 78 : : 1 : $124\frac{4}{5}$ *Fath. age.*

Or otherwise thus:

Place the several Terms in the Question according to the Directions given in the Eighth of Chap. 14. and then they will stand thus.

Youngest

Youngeſt Sons age 16 = $\frac{1}{3}$ *ſecond Sons age.*
Second Sons age — $6\frac{1}{2}$ = 4 *eldeſt Sons age.*
Eldeſt Sons age — 1 = $\frac{1}{8}$ *Fathers age.*
Fathers age — 1 = ? — $124\frac{4}{5}$ *Years.*

Then multiply the Terms which ſtand in the greater Column continually, and the Product is 104; which being divided by the Product of the Terms in the leaſt Column (*viz.* $\frac{1}{6}$) the Quotient is $124\frac{4}{5}$, as before.

14. There is 3120 *d.* to be diſtributed amongſt three ſorts of Perſons, *viz.* Men 6 *d.* apiece, Women 4 *d.* apiece, and Children 2 *d.* apiece, in ſuch ſort that for every Man that receiveth, two Women ſhall receive; and for every five Women that receive, ſix Children ſhall receive their parts of the aforeſaid Sum. How many Men, Women, and Children muſt there be to receive it? *Anſw.* 166 Men, 332 Women, and 398 Children.

Firſt, Find the Number of Children in proportion to that of the Men, thus:

Wo. Chil. We. Child.
5 : 6 : : 2 : $2\frac{2}{5}$

Secondly, Find the Value of the ſaid Proportionals

Proportionals by their aforeſaid Shares, thus:

	d.
1 *Man*	6
2 *Women*	8
$2\frac{2}{5}$ *Children*	$4\frac{4}{5}$
	$18\frac{4}{5}$

Thirdly, Say,

d.	*d.*			
If $18\frac{4}{5}$	: 3120	: :	1 : 166	*Men.*
			2 : 332	*Women.*
			$2\frac{2}{5}$: 398	*Children.*

	d.
166 *Sixpences is*	0996
332 *Groats is*	1328
398 *Twopences is*	0796
The Sum given to be diſtributed	3120

15. A Factor is to receive a Sum of Money, and is offered Dollars at 4 *s.* 4 *d.* which are worth but 4 *s.* 3 *d.* or *French* Crowns at 6 *s.* $1\frac{1}{2}$ *d.* which are worth but 6 *s.* By which of the Coins ſhall he ſuſtain leaſt Loſs? *Anſw.* The Dollars.

d.	*d.*	*d.*	*d.*
52 :	1 : :	$73\frac{1}{2}$:	$1\frac{41}{104}$

That is, in the receiving the Dollars, every 6 *s.* $1\frac{1}{2}$ *d.* loſeth $1\frac{3}{4}$; but in receiving the Crowns,

Crowns, 6 *s.* $1\frac{1}{2}$ *d.* loseth $1\frac{1}{2}$, which is a greater Loss than $\frac{+1\frac{1}{4}}{10}$ *d.*

16. What Number is a Mean Proportional betwixt 9 and 16? *Answ.* 12.

First, Multiply the two Sums together, and the Product is 144.

Secondly, Extract the Square Root thereof, (that is, find a Number which being multiplied by it self will produce the said Number) which will be found to be 12; for 12 multiplied by 12 produceth 144: So that 9, 12, 16, are Continual Proportionals. That is,

As 9 : 12 : : 12 : 16

17. What is the first of two Geometrical Mean Proportionals betwixt 6 and 48? *Answ.* 12.

First, Divide 48 by 6, and the Quotient is 8.

Secondly, Extract the Cube Root of 8, (*i. e.* find a Number which being multiplied into it self twice, will produce the said Number) which will be found to be 2.

Thirdly, Multiply 6 by 2, and the Product is 12 for the first Mean Proportional, which being multiplied into 2, produces 24 for the second Mean Proportional: So will 6, 12, 24, 48 be continual Proportionals. For,

As

As 6 : 12 : : 24 : 48

18. What is the firſt of 3 Geometrical Mean Proportionals, between 4 and 64? *Anſw.* 8.

Firſt, Divide 64, the greater Extreme, by 4, the leſſer Extreme, and the Quotient is 16.

Secondly, Extract the Biquadrate Root of 16, which will be found to be 2.

Thirdly, Multiply 4, the leſſer Extreme, by 2, and the Quotient is 8 for the firſt Geometrical Mean; which multiplied into 2, produceth 16 for the ſecond Geometrical Mean; which multiplied again into 2, produceth 32 for the third Geometrical Mean. For,

As 4 : 8 : : 8 : 16 : : 16 : 32 : : 32 : 64

19. If 300 *l.* being put out at Intereſt, be encreas'd to 357,3048 *l.* in 3 Years, what Rate of Compound Intereſt was it put out at? *Anſw.* 6 *l. per Cent.*

Firſt, Find the firſt of two Geometrical Means between 300 *l.* and 357,3048 *l.* which by the Seventeenth of this Chapter will be 318.

Secondly, From 318 ſubſtract 300, and there remains 18 *l.* which is the Intereſt of

300 *l.*

300 *l.* for a Year. Now to find the Interest of 100 *l.* for one Year, say,

l.	*l.*	*l.*	*l.*
300	18	100	6

By which I find the Interest of 100 *l.* *per Annum*, to be 6 *l.*

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